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MICRO JOURNAL

VOLUME III ISSUE VII • Devoted to the 68XX User • July 1981
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UniFLEX is the first full capability multi-user operating system available for microprocessors. Designed for the 6809 and 68000, it offers its users a very friendly computing environment. After a user 'logs-in' with his user name and password, any of the system programs may be run at will. One user may run the text editor while another runs BASIC and still another runs the C compiler. Each user operates in his own system environment, unaware of other user activity. The total number of users is only restricted by the resources and efficiency of the hardware in use.



UniFLEX is a true multi-tasking operating system. Not only may several users run different programs, but one user may run several programs at a time. For example, a compilation of one file could be initiated while simultaneously making changes to another file using the text editor. New tasks are generated in the system by the 'fork' operation. Tasks may be run in the background or 'locked' in main memory to assist critical response times. Intertask communication is also supported through the 'pipe' mechanism.



The design of UniFLEX, with its hierarchical file system and device independent I/O, allows the creation of a variety of complex support programs. There is currently a wide variety of software available and under development. Included in this list is a Text Processing System for word processing functions, BASIC interpreter and precompiler for general programming and educational use, native C and Pascal compilers for more advanced programming, soft/merge for business applications, and a variety of debug packages. The standard system includes a text editor, assembler, and about forty utility programs. UniFLEX for 6809 is sold with a single CPU license and one years maintenance for \$450.00. Additional yearly maintenance is available for \$100.00. OEM licenses are also available.

FLEX^M

UniFLEX is offered for the advanced microprocessor systems. FLEX, the industry standard for 6800 and 6809 systems, is offered for smaller, single user systems. A full line of FLEX support software and OEM licenses are also available.



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68'

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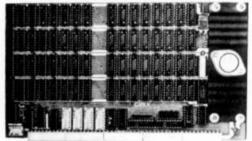
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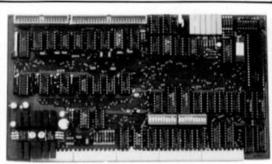
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The GIMIX DMA DISK CONTROLLER (\$548.68) uses high speed Direct Memory Access (DMA) for data transfers to and from system memory. It supports any combination of drives, 8" and 5"; single and double headed; single and double track (48 and 96 TPI); alngle and double denalty; up to 4 drives total. The board features both a phase-locked loop data asparator and adjustable write precompensation to insure high reliability, and can be used in 6809 systems running at 1, 1.5. and 2 MHz.

Available aoftware Includes GIMIX veralona of the 6809 FLEX diak operating system, \$90.00. OS-9 and UniFLEX will elso be available.



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SEE GHOST AD PAGES 43, 46, 48, & 56

BASICØ9™ has a dual personality.

One craves meat-andpotatoes BASIC.

he other prefers Programme ala Pascal.

Some people say BASIC 99 is really a PASCAL in disguise, others say it's still BASIC. You'll understand this delightful dilemma when you look at both versions of the "bubble sort" program shown below; both can be run by BASIC 99. The program on top is unstructured and hard to understand, but it's traditional BASIC. The program on the bottom is well-structured and easy to follow, a virtue of PASCAL. With BASIC 99 you can program either way, or mix the best of both. It's like getting two languages for the price of one.

SORT AN ARRAY IN ASCENDING SEQUENCE

90 DIM A(5)

100 1=5

110 IF 1-1 THEN 200

120 FOR J=1 TO 1-1

130 IF A(J) <- A(J+1) THEN 170

140 T = A(J+1)

150 AU+1)-AU)

160 A(J) - T 170 NEXT J

180 1=1-1

190 GOTO 110

200 RETURN

DIM array(5)
outer = 5
WHILE outer> 1 DO
outer = outer = 1
FOR inner = 1 TO outer
IF array(inner)> = array(inner + 1) THEN
temp = array(inner + 1)
array(inner) = temp
ENDIF
ENDIF
ENDIF
ENDWHILE
RETURN

Makes programs better

BASIC09 has five kinds of loop structures: WHILE . . DO, REPEAT . . UNTIL.



LOOP .. ENDLOOP, FOR .. NEXT and IF . . THEN . . ELSE. If one of the five built-in data types (byte, integer, real, string, and boolean) doesn't suit the problem, you can make a new one of your liking with the TYPE statement. Need a tree. linked list, or symbol table? Complex nonrectangular data structures using any combination of data types are easy to define. Modular programming breaks down large programs to smaller, more manageable elements. BASIC#9 lets you create independent program modules called "procedures" with local variables for recursion plus parameter passing to any other BASIC#9 or machine language procedure. There is a complete set of statements for device-independent sequent thor random I/O, plus a superlative PRINT USING

Makes programs faster

No full-feature BASIC for any 8-bit microprocessor is faster than BASIC 99, because it is an interactive compiler. As each program line is entered, it is instantly compiled to a smaller, faster form. Because BASIC 99 automatically converts programs back to original "source" form for listing, it is as friendly and easy-to-use as traditional interpreter BASICs. Each procedure can be independently compiled to position-independent, reentrant, ROMable format. Microware developed a new ultra-fast 9-digit-accuracy floating point math system just for BASIC 99. And if that's still

not fast enough, there's BYTE and INTEGER arithmetic.

Features that make programs easier to write

The compiler is integrated with a full-feature string AND line-number oriented text editor. If you make a mistake, BASIC#9 tells you instantly, String-oriented commands such as search, change, change all occurances, delete, and insert can be used on programs with or without line numbers. There's an automatic line renumbering function too.

Features that make programs easy to test

Debugging often takes Innger than writing a program. That's why BASIC/9's integral high-level debugger sets it apart from all other compiled OR interpretive languages. The TRACE command shows you each statement executed in BASIC form, plus the result of any expression evaluation. STEP lets you run one or more statements at a time, LET and PRINT allow you to examine or change the values of variables, by name. STATE lists procedure calling order, and there are nine other debug commands. If you need to correct a program, you can edit, recompile, and rerun it in seconds.

Microware* software is available for most popular 6809 computer systems. Source listings and yearly maintenance update service are sold separately for most programs.

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Does timesharing on a small system make sense?



application. Command line I/O file redirection means you specify what device and/or files a program will use when you run it,

not when you write it.

The convenience of an advanced operating

of several single-user systems.

Sophistication does not require complexity. Many OS-9 users say that it is actually easier to use than the older 6800-type operating systems. Consider how easy it is to run multiple programs: to run a program you just type its name and hit 'return.' To run a program as a separate job, you type its name, an '&' character, then hit return, The program runs as usual, but OS-9 comes back immediately and is ready for your next command. Simple commands let you see each program's status, set its priority, or about it.

The file management system has fast, byte-addressable random-and sequentialaccess files. The tree-structured multiple directory system lets you create separate disk directories for each user, project, or

Efficiency and hardware versatility

No other operating system can run on such a broad range of hardware: the overall RAM requirement for Level One is 32K to 56K RAM. Memory utilization is superlative because OS-9 lets multiple tasks "share" the same reentrant program. For example, if two users run BASICØ9, only one "copy" is actually loaded into memory. The Level Two version of OS-9 can utilize up to a megabyte of memory on systems having memory management hardware (both versions come with complete timesharing support).

OS-9's device independent I/O system can handle almost any number and combination of 1/O

devices: five or eight inch diskettes, winchester disks, disk cartridges, serial and parallel ports. memory-mapped video displays. and more.

Microware® offers a large selection of "stock" device interface software modules. or you can create your own: all the information you need is in the manuals.

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RTH FLEX COMPATIBLE FORTH

I... GOING FORTH

2... GOING X-FORTH

included on diskl3

By Charles (Chuck) Eaker, Ph.D

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Tutonal on the use of FORTH that makes it a snop to learn!!

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operations, stocks, input words, output words, strings, disk \$/O,

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for ease of use! Glassary listing included with each section.

Glossary sorted alphabetically in addition to that in the

users manual. Source of all but the care of X-FORTH (also

3... USER'S MANUAL DOCUMENTATION AND GLOSSARY

4 Port Ring Bound Monual (over 400 pagest)

Shows you what the 'X' in X-FORTH is all about

X-FORTH extensions and FLEX interface

4.. GLOSSARY AND SOURCE LISTING

"This is obviously the most comprehensive manual that's ever been produced on FORTH. It's vostly more complete than anything eigel The way he talks about things is not only good reading, but he makes it easy to pick up on the first try."

Soid Ron Anderson, '68 MICRO JOURNAL's contributing editor, talking about the X-FORTH manual.

X-FORTH is the best FORTH there is for 6809/6800 computers running FLEX! There's no better way to put it. X-FORTH beats the competition hands down and here's why

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She can read and write FLEX random and sequential files. She can even read and write the sequential files RANDOMLY! Uses FLEX I/O for terminal and printer. Honort TTYSET

TWO EDITORS

She has a TTV editor modeled after the FORTH INC. editor rather than the FIG version

She has a FULL SCREEN EDITOR for terminals that support cursor addressing

STANDARD ASSEMBLE

She uses standard MOTOROLA menamics thus 'LDA [44]' becomes '[44] LDA' in X-FORTH 6809 assembler also supports 6800 menomics!

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By Dick Bartholomew

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2 ... XREF 3.. EDIT

Cross reference listing of BASIC programs. Edit o BASIC program that's in memory while in BASICITII

NOTE: For TSC X8ASIC only.

Programs are written in 6809 assembly language.



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4. BROWSE Like SCAN but in

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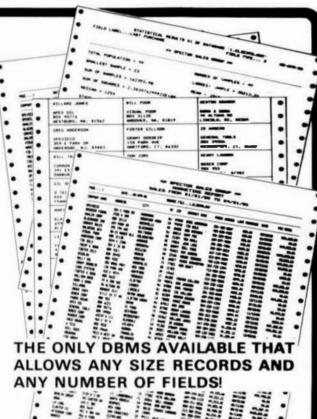
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Numerous complaints have been received, by 68 Micro Journal, in the past month or so, concerning the following past advertiser:

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Should this situation be resolved, to the satisfaction of the complaining readers, and we are properly nofified, we will inform our readers, by a like notice in 68 Micro Journal. Until such time it is recommended that any reader dealing with the above named company understand the contents of the above.

Don Williams Sr., Publisher

Flex User Notes

BY: RONALD W. ANDERSON 3540 STRUBRIDGE COURT ANN ARBOR, MI 48105

ON TEST ING PROGRAMS

live been evaluating a lot of software recently, and a section of a book I have keeps coming to mind. I have received permission from Winthrop Publishers to quote It for you. It deals with the various levels of testing of a program. Some of us don't know how to test our programs. Some don't care to test them. If, however, you are going to sell a program and you don't want to invite disaster, you had better spend some time testing your efforts. The following notice is required by Winthrop:

From A PRIMER ON PASCAL, first edition by Richard Conway, David Gries, and E. Carl Zimmerman. Copyright (c) 1976. WINTHROP COMPUTER SYSTEMS SERIES. Reprinted by permission of Winthrop Publishers, inc., Cambridge, Massachusetts.

THE MEANING OF CORRECTNESS

""Program correctness" is not easily defined. The programmer and user of a program may discover they use quite different meanings of the word "correctness", and hence have quite different expectations of program performance. Consider the following possible interpretations of correctness—listed in order of increasing difficulty of achievement:

i. The program contains no syntax errors that can be detected during translation by the language processor.

- 2. The program contains no errors, either of syntax invalid operation, that can be automatically detect during translation or execution of the program.
- There exists some set of test data for which t program will yield the correct answer.
- 4. For a typical (reasonable or random) set of test de the program will yield the correct answer.
- 5. For deliberately difficult sets of test data t program will yield the correct answers.
- 6. For all possible sets of data which are valid w respect to the problem specification, the progr yields the correct answers.
- 7. For all possible sets of valid test data, and for likely conditions of erroneous input, the program give: correct (or at least reasonable) answer.
- 8. for all possible input, the program gives correct reasonable answers.

In the early stages of your programmit experience you will feel harassed by error message during translation, and feel a sense of achievement when you have attained level I correctness. However the absence of error messages is only a necessary a not a sufficient condition for reasonable correctnes. You will eventually regard the detection of such error as a helpful service, which unfortunately detects on the easiest of errors.

Some students never mature beyond level 3 f an interpretation of correctness. We are regular involved in arguments challenging the grade assigned a problem on grounds that it "worked" on the student own data, hence must be correct. In effect, the stude is arguing that level 3 is adequate. Considering high levels (say 4, 5 or 6) it is clear that satisfacto performance on any single set of test data is a sufficient grounds for an assertion of correctness, be failure on a single test is sufficient to demonstration that the program is not correct. NO MATTER HOW MATESTS THE PROGRAM MAY HAVE PASSED SUCCESSFULL JUST ONE TEST ON WHICH IT FAILS IS ENOUGH TO SHITHAT IT IS NOT CORRECT. This is not inherently democratic process, and a program tha works "most the time" is a dangerous tool.

From the "customer's" point of view reasonable definition of correctness is certainly riless than level 6, while the customer will maintain the certain implied requirements do not have to explicitly stated. In effect, this corresponds to t "implied warranty of merchantability" that a compania manufactured product. A consumer is entitled assume that a product is "sultable for the prupose of which it is intended". A car buyer, for example, congistfully assume that all the wheels will remain firm attached to the car, without having to obtain a writt guarantee from the dealer. In the same way, much assumed about a computer program, without its having been explicitly detailed in the problem requirement. The user of a program is entitled to consider incorrect if it falls to satisfy implicit as well explicit requirements.

Unfortunately, this often leads to heat discussions between programmer and user, the obje being to assign blame for a program belatedly found be incorrect. The programmer takes the position if there is no such thing as implicit requirements; tuser maintains that, in retrospect, anything neglected to specify is covered by implic commonsense requirements. Both parties should reall that implicit requirements are an inherent part of mc problem descriptions, and that it is a MUTU responsibility to explore this subject to ensu

mutual understanding of context of use, nature of errors, appropriate reactions and communications.

The PRIMARY RESPONSIBILITY RESTS WITH THE PROGRAMMER. A program is INCORRECT IF IT DOES NOT SERVE THE USER'S PURPOSES. This may occur because the programmer failed to elicit an adequate description, because he failed to recognize implicit requirements, or because he made mistakes in designing or translating the algorithm into a programming language. Most programmers admit responsibility for only the last two sources of error, but the distinction between different types of failure is not interesting to a user with an unsolved problem.

in summary, the situation is the following. The user would like to have level 8 correctness — but this is usually impossible, and he might as well get used to that fact. Level 7 is a reasonable compromise, which is obviously going to lead to arguments since it leaves critical questions open to varying interpretations. The programmer's dilemna is that level 5 is the highest that can be achieved by purely empirical means — by running the program on test cases — so he must thoughtfully design test cases while writing the program that will permit a plausible assertion that level 6 has been achieved. To achieve level 7 the programmer must know enough about the intended use of the program to estimate what errors are likely to be encountered, and what response is appropriate."

End of quote. Quite a challenge to all of us who call ourselves programmers in any sense of the word. I recently received some Business software for review. I discovered that by answering the prompt "FILENAME" with the name of an existing file, without warning the existing file was deleted and replaced with the new file. In my opinion, that indicates failure of the program at level 4. I think Business users have a right to expect more than this. There is some very good software available, but a small business owner/user who with some misglvings has bought a Microcomputer system and has purchased software that has been debugged to level 4, will soon give up and tell all his friends that small computers are no good for small business applications.

Along this line I can report some very encouraging news. In addition to the software mentioned above, I've purchased software from another supplier, and had a couple of things sent me for "preview" from a third supplier. I can truthfully say that I have not been easy on those suppliers in terms of my reaction to bugs that I have found. I must say that their response has in all three cases been very favorable. I'm sure that I've irritated some of the suppliers with my negative reactions, but all have indicated that my complaints were for the most part valid, and ALL HAVE MADE CORRECTIONS AND SUPPLIED ME WITH UPDATED SOFTWARE. Further, I must say that the responses have been very timely. One of the authors of a particular Program called to tell me about the fixes, mention some improvements that are coming, and to say that surely others have found some of these problems, but that no one had reported them, I was thanked for responding and helping to get the software debugged.

Software is getting more sophisticated these days. The authors/suppliers point out that in general they have little way to imagine the uses to which their products will eventually be put. They have, in my experience been unanimous in wanting to have the best product possible. They just need to know when a bug is found, or a feature is needed.

I do, however think that more thorough testing of products before they are offered to the public, would result in more favorable initial reaction to the products. This therefore is a plea for more thought in testing of your products before their release. I earn a living working for a company with a product. I know that

companies starve or go broke if they don't ship their wares regularly. I also know that companies go broke when warranty expenses exceed profits, or their reputation is wrecked by customer dissatisfaction. It is inevitable that customers will be the final testers of software, and none of us minds an occasional obscure problem with new software, if the supplier is responsive. What constitutes good software, is a subjective sort of thing with regard to features and operator interface. Whether the software is debugged or not, is a rather more objective thing. Consumers don't want to be the ones to find gross problems in new software.

All of us who program for a living or a supplement to our living need to take this to heart and try to produce software that reaches level 6 plus. If I've intrigued any of you with the contents of A PRIMER ON PASCAL, a new edition is now available. Write Winthrop Publishers, Inc. 17 Dunster St., Cambridge, MA 02138 for further information on price and availability. The whole book is written in this manner. It is much more than just another book on using another programming language. It is in fact, a companion book to a volume by the same authors called "A Primer on Structured Programming — Using PL/1, PL/C, and PL/CT". It contains a great deal of information on programming by "stepwise refinement", an approach whose principles are language independent.

NEW THINGS

I recently received a notice from TSC that their Sort Merge package is now available for UNIFLEX.

CALIFORNIA CORRECTIONAL INDUSTRIES

Because of this column, I run across Interesting people and stories. This one is intimately related to computing, so here goes. In February, I received a letter from Dennis Herk who is a "resident" of California State Prison at San Luis Obispo. Dennis sent a most helpful letter regarding using active terminations to cure SS-50 Bus intermittents. I answered his letter, and the next one from him brought a reprint of an article in the Prison Newspaper, and what I would call a product brochure. I've asked permission to write this up, and received it from Dennis and his Supervisor.

CCI employes about 400 of the 2400 Inmates at the facility. There are various plants such as a Knitting Mill, Laundry, Shoe Factory, Textile Plant, and Printing Plant. Dennis is employed in Maintenance, and has been involved in the design and construction of some controllers for the various machines in CCI. The brochure describes a Dryer Control that measures moisture content of the contents of the Laundry Dryer, and shuts It off at the correct point to conserve energy and maximize "production". It also describes a Washer Polling Control that conserves energy and reduces water pressure fluctuation by allowing only one washer to fill at a time. This arrangement also reduces and evens out the load on the water heater. The brochure goes on to say that the control has shown an average 6% saving in energy required for water heating, it concludes with "These control units plus other electronic/electromechanical devices designed by California Correctional Industries, are offered for sale to public agencies. Our design team is open to the challenge of developing similar automatic controls and other devices to meet your specific requirements."

Dennis has a 6800 system running and is "teaching the managers basic operation during lunch." He finds it difficult to convince people there that Microcomputers can achieve the throughput of a "mini" (Just as the rest of us do), I'd like to close this little section with a quote from Dennis and a comment. Dennis

says "I'm not...ashamed of making a mistake. Now it I let greed guide me again into one of these cesspools, then shame would be apropo." Dennis, with an attitude like that, you won't have to worry about seeing the inside of one of those places again!

MORE ON PRIMES PROGRAM OPTIMIZATION

Last column I wrote about the virtues of thinking a little about optimizing the Algorithm for Improving speed of execution of a program. My example was the Prime program, and I reported a time of 1 minute and 12 seconds for the primes to 10000 with Omegasoft Pascal. The other night I was looking at the program and decided that I had lots of multiples to compare the squares of my test numbers to the number being tested, in order to terminate my testing at the optimum point. Since I have an array of the first primes found, I decided to generate a second array of their squares. That way, the multiplication would only have to be done once for each of the primes found that are less than the square root of the maximum number. I wondered if the additional array access would take more time than the multiplications. I found out something very interesting. The added array has a dimension of 50 which means that it only takes 100 bytes of RAM at runtime, so that is not much of a disadvantage. The run time for Primes to 1000 was virtually the same as the original program. However, as the numbers being tested get larger and larger, more multiplications are eliminated, and the array access time begins to be significantly less than the time spent previously multiplying. The result is that for primes to 10000, the execution time is reduced to I minute and 6 seconds, about 8.3% improvement over the old program. I had tried similar optimizations before, but hadn't tested them on the larger limit. For your amusement, I have Included the listing for the program in Pascal here, (The "most optimum" version).

Perhaps someone out there will find another factor of 2 or 3 in time reduction by seeing the obvious that I am missing. While I am at it, I would like to mention another example of optimization. The application is rather complex, but essentially, it is a program that takes all possible combinations of several variables and finds the "best set" by some criteria that are dictated by the problem, in this case, the problem was a mechanical part with 8 possible locations for balance weights, and each location could have no weight or one of 6 fixed sizes of balancing weights. The idea is to find the smallest set of weight values and positions that will adequately correct any unbalance amount and position within some maximum limit, I had written a program some time ago for a different though similar application, and managed to get it to run in about 2 hours. A more complicated problem came along, and following my method for it resulted in a program that ran about 50 hours. A friend took the problem home for a week-end of sitting in front of the computer, and came up with another approach. His program runs in about 20 minutes and produces a very good set of solutions to the problem. Sometimes a fresh approach can result in drastic savings in computer time.

There was a net gain here, since the program didn't take my friend Mika Myers anywhere near 50 hours to write and debug. Further, the approach is a valid one for future problems of a similar nature. Mike found several interesting approaches to reducing run time. First he scaled all the data so he could use integer variables in his BASIC. Secondly, he started with the worst case in terms of using excessive numbers and sizes of weights to make corrections. If any solution was found later in the program that "covered" the same unbalance area as an older one, it had to use less weights and therefore be a better solution. Mike therefore cleverly eliminated a lot of comparisons to see if a new value was "better" than an older one. Mike also used several large arrays to hold all the values

necessary for the calculation, therefore eliminating the necessity for repeatedly calculating, for example, the Sine of 57 degrees, etc. Overall, the solution was a very good one. This is particularly impressive to me since Mike is not an engineer. His job is in Sales. He has had a computer of his own for a couple of years now, and started like most of us at ground zero at that time. Anyone out there have some further concrete examples of such things?

FLASH: April '68' just arrived. In it, Dave Shirk of TSC made some comments about the Moreira article In Feb. 1681, included is an algorithm for finding the primes by Wirth. Dave reports the time to write the numbers to their terminal at about 10 seconds. They must be running 9600 baud, I checked my write time and arrived at 5 seconds at 19,200 baud. Since a copy of Lucidata's Pascal release 3.9 arrived today also, I dumped in the Wirth algorithm program and ran it in Lucidata and Omegasoft Pascals WITHOUT ANY CHANGES OF ANY KIND!! Adjusting Dave Shirk's time to my 19K baud (so we can compare apples and apples), apparently TSC Pascal will run the program in under 11 seconds. Omegasoft did it in 34 seconds (About twice as fast as my most recent effort reported above), and Lucidata took 125 seconds, Lucidata, incidentally, ran my latest version in 156 seconds. Next month, i will report on the new features of Lucidata Pascal, and perhaps try to explain the Wirth algorithm for the Primes, and why it is again more efficient. Dave's listing does contain one non-fatal error, the correction of which makes the program even more impressive. Down near the end of the listing there is a statement 'IF I <= NL THEN P{!]:=X;' Therefore, no assignments are made to the P array beyond the subscript equal to NL. The VAR declaration should therefore be P,V: ARRAYII..NLI OF INTEGER; This reduces the arrays to dimension 35 rather than 1229. This doesn't change the execution time, but the RAM required for the data stack is much less, Just Incidentally, some authorities include 1 as a prime number and others do not. You will find that my program listed here includes 1 and finds 1230 primes between 1 and 10000.

As soon as I can check out TSC Pascal, I will be reporting on it too. Apparently it is very fast, i'd like to pose a question to Dave Shirk regarding his comments on maximum use of the 6809 features. Dave, I can see that having BASIC in position independent code might be a big advantage with Unifiex in a multi-user situation in which each user is allotted his "chunk" of memory, but what advantage is it to the large number of users that have FLEX9 single user systems, and are not even aware of how (nor have they need) to load it anywhere else in memory? I fully agree that speed isn't the only important parameter in evaluating software, and TSC is to be commended tor planning ahead and making BASIC compatible with the multi-user system by taking advantage of the position independent code possible with the '091, but it is a feature that many of the users will not be taking advantage of.

```
PROGRAM PRIME (EMPUT, OUTPUT) ; ( FIND PRIMES TO MAXNUMBER )
```

```
NUMBER : EMTEGER; ( CANDIDATE FOR PREMALETY TEST )
MAKNUMBER: INTEGER; ( UPPER LEMIT OF PRIMES TO BE FOUND;
ITEM : INTEGER; ( COUNTER FOR PRIMES FOUND)

K,L : EMTEGER; ( LOOP INDICES )

COLUMN : INTEGER; ( FOR OUTPUT FORMATTING)

PRIM : ARRAY [1...$0] OF INTEGER; ( SAVE PRIMES TO SORT(MAKNUM) )

PRIMSOUR: ARRAY (1...$0) OF INTEGER; ( PRIMES SDIARED )

SMITCH : BOOLEAM; ( SWITCH FOR SAYING OF PRIMES )

ISPRIME : BOOLEAM; ( SIGNAL THAT PRIME WAS FOUND )
```

BESIN

PRIM (1):=(; PRIM (2):=2; PRIM (3):=3; PRIMSQUR (:) := 1; FRIMSQUR (2) := 4; PRIMSQUR(3) := 9;

```
WELTELN C'INPUT UPPER 1 INIT DE PRIMES'):
   READ (MAXNUMBER) :
   WRETE (PRIN EI] : 7,PRIN [2] : 7,PRIN [3] : 7) :
   I INITIALIZE VARIABLES AND POINTERS >
  ITEM:=3: COLUMN := 3: NUMBER:=5: L:=4: SWITCH:=TRUE:
   NHILE NIMBER (= MAXNUMBER OF
     ISPAINE: = TRUE: X:=3: ( ASSUME NUMBER IS PRINE UNTIL PROVEN NOT )
      WHILE IPPINSOUR () ] (= NUMBER) AND ISPRINE DO
        IF NUMBER HOD PRIM (k) = 0 THEN ISPRIME: = FALSE:
        E:=Eal:
     END: (MHSLE PRIMSQUE)
      IF ISPRIME THEN
      REGIN.
        NRITE (NUMBER : 71:
        ITEB:= ITEB+1;
         COLUMN := COLUMN + 1;
         IF COLUMN = 10 THER
         BEGIN
           MRIBELN:
           COLUMN := 0
        IF SHETCH THEN
        BEGIN
           PRIM ILI:= NUMBER;
           PRINSBIR (L) := MUMBER & NUMBER :
           EF PRINSGER (L) MAXNUMBER THEM SHITCH: = FALSE;
           6:= L+1:
        END; (IF SHITCH)
     END; (IF ISPRIME)
     NUMBER := NUMBER+2:
  END; (WHILE NUMBER)
   MRITERN .
  WRITELM ! THERE ARE ", ITEM," PRIMES BETWEEN 1 AND ', MAXMUMBERI;
FND. (PRINE)
```

febe

While attending the 'Philly '80' show last summer, I was Impressed with a Standard \$50 Bus main frame kit being shown. Later we received, for review, a kit including the Cherry Pro keyboard. This is a report of the feber group, inc. - ECB-50 kit.

The kit came with the following units. Case - A two piece injection moided styrene case with provisions for a cooling fan. The case is furnished unpainted for custom finishing (we painted ours white for about \$2.50 in spray paint). Keyboard and portal cutouts are provided. Rubber feet and a smoked piexiglass front panel is standard.

Power Supply - 15 amp @ 9 volts and 2.5 amp @ +/- 17 volt. We find this was adequate for fully populating the motherboard and also a pair of 5 1/4 inch disks. All voltages appear at a barrier strip.

Motherboard - Tinned double sided PC card with plated through holes. Sockets provided for all IC's. All address and data lines are terminated. User selectable port size (4,8,16, etc). Base address of ports addressable \$8000 to febet hex (you name it). Seven 50 pin slots and eight 30 pin I/O slots.

Keyboard - Cherry Pro with 67 keys. 128 ASCII codes, 5 volt only supply. Five user definable keys and four mode operation. Repeat option available.

When we received ours the shipping policy was that febe shipped the manual about a week before the mainframe kit. This allows time for leisure study and planning for the construction period. Over the years i have talked to many, many builders who stated that they wished that they had read the 'book' more and not been in such a 'darned fired hurry'! In our case we know it helped as the builder had never attempted to build ANY kit, and to top it off, he knew nothing about computers (then).

We wanted to see if it were actually documented sufficiently to allow a novice an even break in getting things right. It did and he did, fired up first time and no problems. The manual is very complete and there was only one major (or minor depending on skill level) problem in the documentation. An readily apparent difference between the power supply component placement drawing and the parts layout diagrams. A quick reference to the main diagrams resolved this difference. Otherwise, everything went together, and WORKED as indicated in the manuals. A revised (and accurate) drawing was received 2 days after the mistake was discovered. It is fair to note that the serial number of our kit was number 15. We have seen some kits that have been produced for years (and the serial number up in the thousands), yet they still have some serious mistakes in the manuals that can do a real thumping on your day (and project).



DOCUMENTATION

The manual consists of not only written instructions, but also full 'blue print' type technical drawings (circuit), logic and layout. Also included was an 8X11 slick photo of the system from two angles; parts placement and a look at how it is supposed to look when completed. The step-by-step instructions were in the proper order and no parts were missing.

An especially helpful section was the one headed 'SPECIAL NOTES'. This portion of the manual listed not only things to beware of in the construction and testing of the completed computer system, but also has some important tips on what to look for when populating the system with logic boards. Tips include: Port size selection, port address decoding, power supply loading, interfacing various cards and boards, 6809 slow peripherals and mention of an EPROM BASIC for this system and others. Also if 'all else fails' a telephone number is provided to allow the stumped builder immediate advice and technical help from the source. This is one of only a few who encourage telephone cells for assistance. Complete backup repair service is available if needed from febe.

The entire system is guaranteed for a period of 90 days from date of receipt.

THE FEBE GROUP

febe has organized a users group of technicians (factory and user) allke, engineers and others to assist kit builders and to pass along hints and kinks, to make life a little easier. This group meets regularly and promises to extend the help that some will need.

CONCLUSION

The quality of the materials and components furnished is commercial grade. The cabinet is both sturdy and attractive. The power supply is adequate and has more reserve than many more expensive systems. The documentation is complete and accurate. And we cen truthfully say 'that a rank novice can put it together'.

Now that we have it running, we have some special plans for this system. It will be our CBB (community bulletin board) system. It will be connected to the land line by a THOMAS INSTRUMENTATION MODEM BOARD. A review on this at a later date, however, mention is made here that we have received many good remarks concerning this modem. The CPU will be a 68800, 2 mbz, running FLEX 2.0. We have all the hardware on hand. Currently we are attempting to get the necessary software to complete the hook up. This system, when fuctional, will allow 68 Micro Journal readers an access and message (program) swapping vehicle. We will keep you informed as we progress on this project.

Additional information can be secured from:

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John P. Tucker POB 2898 Laredo, TX 78041

The user of the SS-50 bus is faced with probably the fewest in number of hardware problems of all the micro bus systems. He is also blessed with a wide variety of peripherals for his system. But he suffers from a dearth of good, usable business software.

Gary Magnusen of Lafayette, Indiana, has released a series of programs for data manipulation that close a big gap in the software line. Called EZDATA MANAGEMENT SYSTEM, the programs are aptly named. Making use of many of the capabilities of today's intelligent terminals, he has devised ways of creating files, sorting and manipulating them according to a wide variety of keys, and outputting them in formatted manner to either screen or printer.

Excellently conceived documentation accompanies the disk(s) to assist a programmer in configuring the programs to his own system. It is not necessary to tamper with the program proper as all configuration is done through a menu system. The programs arrived configured for Gary's Micro-Term Mime-I terminal. Despite my unfamiliarity with my own brand new SWTPCo 8212, It took me about ten minutes to make the necessary changes to have the programs up and running.

And run, they do! Running under Flex 2.0, every step I tried worked without flaw-EZCTL creates and updates an EZDATA CONTROL file that acts as a job control system. This allows just a few key strokes to set up the most complex sort program, for instance, and execute it without operator intervention. EZDATA creates an EZDATA file, the basic file used throughout for input. EZTEXT creates a text file from an EZDATA file with essentially no effort on the users part. EZYIEW makes it possible to read what has been created. The files are not put on disk in a manner that the Flex LIST utility can be used to read them but the EZYIEW system puts them on the screen just as you wish to see them.

Recognizing that no one ever really creates a "polished" file from scratch, EZEDIT is included to allow you to get in and do your thing on your files.

Perhaps my favorite of all the programs was EZSORT. Almost limitless ways of sorting are allowed because of the wide variety of keys that can be used. Several keys can be used at once — one can sort by, say, Zip code, last name, and membership status if working with such a file. The program is intelligent: If sorting by last-name + first name + middle initial, the program can recognize that not all persons have middle initials. It runs right along without bombing in such circumstances. EZSORT performs a key sort using the keys that were established in EZCTL (EZCONTROL).

Only the disk addresses and keys are read, and only the disk addresses are rewritten. Work space and time are reduced by several orders of magnitude, using this approach. If the file to be sorted is too big to fit in memory, the program creates (and deletes) work files on disk without operator intervention. No time is wasted outputting files during or after sorts as all work is done directly on the disks.

EZPRNT will output to your printer or display on the terminal the results of your work. You may utilize the "Reduced intensity" feature on your terminal in the display of protected fields and otherwise use every feature of your system throughout the group of programs, AS I UNDERSTAND THEM AT THIS TIME! I emphasize that because the programs are much too fiexible to completely digest within a week or so.

Since files have a way of becoming obsolete, an EZPURG system is included to purge EZDATA files.

Anyone using extensive listings, such a mailing lists with keys, membership lists for organizations, subscription lists for publications, etc., should find it worthwhile to obtain and study this set of programs. It is already becoming a valuable addition to our file of software.

EZSORT alone would make this a worthwhile acquisition. But it is much, much more than just another sort system. The programs live up to their name of EZDATA MANAGEMENT SYSTEM. Anyone considering the system should, however, be aware that it is intended to work with an intelligent terminal. Direct cursor cortrol is an absolute must-

The programs are f-a-s-tl In a telephone conversation, Gary mentioned that he runs his terminal at 9,600 baud. That gave me the idea of trying out the programs at various baud rates, since the SWTPCo terminal is software baud rate settable. They ran flawlessly from 50 baud to 38,400 baud. I could find no indication that the programs were slowing output at the highest rates.

I do wish, though, that the listings were more responsive to the paramters in the TTYSET of Flex 2.0. Some listings run through too quickly to digest and don't pause and can't be interrupted by the ESCAPE key. How about it, Gary? (I knew I could find at least one fault. I talk to Hixson so often on the phone that I've caught "Don Williamitis" — I always want one more feature!)

Comments to prospective users: beginner's should expect to sweat a while before making the programs run. Moderately skilled to skilled programmers should expect to spent a few minutes configuring the system and studying the supplied samples. I would rate this AAA material for anyone with moderate or better skills. It is serious material, not for game players. It is one of the better software programs we have received since we started computing. (And we have some goodles!)

For additional information contact: Gary A. Magnusen, 208 Tinkler, Lafayette, Indiana, 47901.

 ${\sf ED^{1}S}$ NOTE: Now how about a 6809 version ${\sf Gary.}$

FAST PRIMES

Brian F. Bailey WB4MMP 5701 S.W. 4th St. Plantation, FLA 33317

I read with interest the letter from Mr. Shirk of TSC comparing processor speeds (April 1981 Issue, pp. 13-14). I agree completely that it is unfair to directly compare the speed of relocatable and/or reentrant programs with absolute code, I must take issue, however, with his comparison of the UNIFLEX Pascal program with the 6809 assembler version. I realize that the efficiency of the algorithm makes a large difference in timing. I therefore wish to show that assembly language is inherently faster than any high level language and that the 6809 is so superior to other 8 bit processors that there is really no comparison. The program PRIME, on this disk, takes advantage of the power of the 6809 so that it computes all of the prime numbers up to 10,000 in only about ONE SECOND (2 Mhz 68B09) or about two seconds at 1 Mhz. Try that on a Z-80! The memory required is N/2 bytes where N is the desired number limit. The primes are flagged in memory so that printout time (highly machine-dependent) is not counted as computation time. Please feel free to publish it if you want to. 73, Brian F. Balley WB4MMP

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6809 JPC TC-3

TC-3 w/68**0**9 by Keith Alexander

Recently, a friend of mine bought a SwTPc 69/K computer, and like most of us started, he is limited to audio cassette tapes ("sloppy disks") for mass storage. We figured he could use my now-unused (since I now have a dual 5" disk system) tape hardware, a Southwest Tech. RC-30 or the JPC Products TC-3 tape interface (see ads

in Micro Journal). This latter device had been the pinnacle of my tame storage when I got my disks. It had collected dust ever since then, though. For still-unknown reasons, we never got the AC-30 to work in his system, so we concentrated on the TC-3.

Now, let me tell you about this product. The interface, which resides on the 30-pin "peripheral" bus of the SWITE (which chassis motherboard doesn't matter) comes not only with all parts, connectors, and a standard-sized (3.5" x 5.25"), solder-masked circuit board, but a comprehensive manual. manual, which is beautifully written, dives circuit diagrams and commented assembly listings of all software to load and write both Kansas-City format (300 bits-per-second. Or "baud") and "High Speed" format tapes, which may optionally be at 2400 or 4800 baud, "constant" demending on one or t.wo values in the program. They also provide guidelines (names and model numbers) of several tape decks that have proven their suitability for the high-speed formats. Your cheapie won't always do the trick. Mike and I have been using the Radio Shack SCT-12 (about \$80), which finds other uses in the home audio system.

Then it hit me. I'd bought my TC-3 from JPC back in the Dark Ages for my (then) 6800. All the software was for 6800. I have dual processor carability built into my system, but Mike's is strictly 6809 (w/SBUG). No bis problem really, just assemble it with TSC's 6809 Macro and the 6800 mnemonics will Assembler be assembled into 6809 code. This produced a 6809 program that I could load into memory off my disk, but which Mike would have to MANUALLY KEY IN WITH S-BUG'S MEMORY EXAMINE/CHANGE FUNCTION whenver he wanted to load a program into his computer. About 300 bytes. Now, I can tell you stories about when I used to routinely 'key-in' and 3K 'object' listings, but now I cringe at the thought. No fun at all. Solution? Phase 2--put all programs in ROM! Our 6809 cpu boards (SWTPc) can hold three 2716 EPROM memories (2K x 8 bit), besides SBUG. It doesn't make sense to put programs like this into a ROM in a 6809 system,

and not make them POSITION-INDEPENDENT. This enables them to be used not only in ANY of the three available PROM sockets, but anywhere in RAM, if you so desire. This was Phase 3.

Now the fun begins. Since this was more or less a rush preject, I didn't re-write the original At first, I merely changed software. the necessary instructions to lend Position. independence (such as LEAX MSG, PCR instead of LDX #MSG). Like the original software, I still used a designated area of RAM for variable storage, some of which had to be PRESET (with address ranges) before running three of the four programs. The next revision took an idea proposed by Mr. Al Moreira of England (see 7-80 P.31)-- all Micro Journal, and temporary storage is variables allocated in the AREA POINTED TO BY THE STRCK REGISTERS, US & SP. The stack is bumped down upon program entry, and restored when exited. The final revision makes the **Programs** "friendlier", by prompting the user for the start and end addresses of the ranges to be loaded or dumped. This was mostly a matter of using the IN2ADR in SBUG, and adding some routine range-checking.

In summary, the following four programs (KC Loader & Writer, and High-Speed Loader & Writer) are:

ROM-ABLE (use no RAM outside of stack) POSITION-INDEPENDENT PROMPTING (no need to preset anything) USE SOME SBUG ROUTINES PRESUME A 1 MHZ. SYSTEM CLOCK

other thins. This little project taught me all about the new I/O pert addressing scheme used on SwTPc's newer motherboards. My original 6800 software and motherboard used 4-address perts, that is, I/O port #2 is \$8008-8008. My klused motherboard (that uses 6800 or 6809 cpu boards and can address I/O at \$8000 or \$5000) still uses four locations per port, while Mike's newer (standard) board uses SIXTEEN memory locations for each I/O slot. If we both use I/O port #0, our software could be identical, but after port 0, our port addresses are all different. The 6821 on the TC-3 board occupies the LOWEST FOUR (at

least) addresses on whatever I/O slot The point is that you may you use. have to adjust the port address references to suit your particular system, depending on which slot you put the TC-3 on, and what kind of addressing scheme your I/O bus has.

As I pointed out, the programs do use routines in SBUG, mostly printing strings and setting the required input from the user. These shouldn't restraints prove too for someone formidable using a menitor, thoush. Just a different matter of plussins in addresses, I would think.

The observant user will notice I retained some of the 6800 mesonics from the original software, and chansed the KC Loader, for In instance, note that I retained 'TAB' instead of replacing it with the 6809's equivalent TFR A.B. However, note also that the TSC 6809 Macro Assembler also translated TAB to the equivalent. SEQUENCE TER A.B. TST A (1F89, 4D), which is nice.

It should be pointed out that the 300-baud Kansas City Standard was only meant as a standard for EXCHENGE of software BETWEEN machines, not. necessarily for MASS STORAGE on ONE The machine. more enterprising bit-twiddler with a 6809 tape system will find this hardware/software system valuable not only for the sake of being able to dump and load tapes in two different formats, but for such bisser BASIC programs as interpreters, compilers, Editors and Assemblers (that are themselves tape-interactive) with a little horsing around and careful patching, you could speed THEIR 'save' 'load' functions up possibly eightfold or more, providing you can find the original SAME and LOAD entry points-- not always so easy.

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LEFR
                                                                                                                                           Check bute from tare
Commane with running checksum
If not tame report Joad smooth
 8854 38
8858 80
8858 1F
8850 32
                               60- 6875
FD/RE
34
67
                                                                                                          DELL.POR
PSTRNG
U.S
SIZE,5
                                                                                                                                          Else, rind bell...
...to sienel finish
Guarantes clean milt...
by fixing up SP...
                                                                                       LIBRO
                                                                                      1997
1FFF
LERS
                                                                                                                                                                                                                                                                                                                                                                                                . HO ORG SPECIFIED! CAN BE ANNAHERE IN MEMORY
  ₩% Æ
                                                                                       )re
                                                                                                             OVE
                                                                                                                                             and exit back to seniter (or styrest)
                                                                                                                                                                                                                                                                                                                                     6900 20
                                                                                                                                                                                                                                                                                                                                                                                                EGIN
  6942 W
                                                            LEAR
                                                                                      Qui
                                                                                                                                                                                                                                                                                                                                                                                                UN
                                                                                                                                                                                                                                                                                                                                     6002 85
                                                                                                                                                                                                                                                                                                                                                                                                                          FCB 5
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               (7-25-11)
                                                                                                                                                                                                                                                                                                                                                    79
45
80 GMEPA
50 FEME
80 FEME
81 BD
94
                                                                                                                                                                                                                                                                                                                                                                                                                                            +SIZE S
S.U
PSGI, PCR
PSTING
INCH
+10
LDROL
                                                                                                                                                                                                                                                                                                                                     0000 32
0000 IF
0007 36
0000 00
000E 60
0011 81
0013 27
                                                                                                                                                                                                                                                                                                                                                                                                                         LEAS
TOR
LETON
JOHN
JOHN
CHANN
WED
                                                                                                                                                                                                                                                                                                                                                                                               LOPE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Set us ustrate stat. Set on stack
US PORTIES WORKED FROM NEED DE 199-5(2E)
                                                                                                        an I App
                                                                                                       HUB.U
8963 C6
6965 E7
6967 80
9967 80
9966 29
6966 29
6967 20
9971 20
9971 20
9976 29
9976 29
9976 29
9972 89
9976 29
9976 89
                                                                                     60
10
10
70
14
04
                                                                                                                                             Set bit count
                                                                                                                                         Dec bit cours.

Presynchronize
Read read bit
Loor and wait for start bit
Throu deen second helf of 1 bit
becrement bit count.
Exit if all 8 bits down
Shift the data right 1 bit
fet next inmut bit.
If bit = 0 Data t.
...or it it's a 1. resunch
Push now bit into data word
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Corriado "METURN" INPULS
                                                            LODE
                                                                                                                                                                                                                                                                                                                                    0015 37
0017 29
0017 29
0019 30
0010 E0
0020 7F
0022 06
0023 57
0020 06
0027 07
                                                                                                                                                                                                                                                                                                                                                                                                                                             SIZE.S
LOND
INSGI.PCR
PSTING
CTLA
42
PRTR
41
CTLA
                                                                                                                                                                                                                                                                                                                                                                  C993
LDVE
00 0128 FDVD3
PV
                                                                                                                                                                                                                                                                                                                                                                                                                          LERG
                                                                                                                                                                                                                                                                                                                                                                                                                         BEA
LEAX
JSP
CLP
LOAN
STAN
LOAN
STAN
LOAN
STAN
                                                                                                           EDGE
LOD3
EDGE
##80
LOD2
#0
LOD2
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Set up PIR
Set data direction
                              80 44 87 88 FT 88 ED
                                                                                                                                           Post to equalize traine
                                                                                                                                                                                                                                                                                                                                    982D 80
982F 81
9831 26
                                                                                                                                                                                                                                                                                                                                                                                               LORE
                                                                                                                                                                                                                                                                                                                                                                                                                        DSR
CHIPA
BHE
                                                                                                                                                                                                                                                                                                                                                                                                                                            E'S
LOSI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Read first character
If not an "Il"...
Then continue search
MBAS 28
                                                           1,004
                                                                                     MS
                                                                                                                                                                                                                                                                                                                                                                 58
39
GE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              Read second character
1f a 19f Unn...
9003 34
9003 4F
9096 4C
9097 F6
909C E1
909E 27
                                                                                    PSAR
ELRIR
LNCR
LNCR
LNAB
RNCB
CTPB
BE D
                                                                                                                                          Save data in A-resister
Lieur count
Increamit count
Test input port A
                                                           EDG?
                                                                                                       PRTA
61
SREF : U
EBG2
                                                                                                                                                                                                                                                                                                                                    66 24 70
66 24 70
                                                                                                                                                                                                                                                                                                                                                                 60 6133
FDFE
                                                                                                                                                                                                                                                                                                                                                                                                                                                                             Sumal finished by
                                                                                                                                                                                                                                                                                                                                                                                                                        LER
                                                                                                                                                                                                                                                                                                                                                                                                                                            BELL PCR
PSTRNG
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              by ringing bell
                                                                                                                                           Input same as reference? Clast looks If so, walt for change
                                                                                                                                                                                                                                                                                                                                    0040 1F
0042 32
0044 7E
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               Guarantee clean exit
stack-wise (SP)
and return to SBUG (or
6770 E7 41
                                                                                     STRE
                                                                                                           SPEF.tI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                            if not a 't'...
then try adding.
Clear checksum
Read byte count in hex
ROLART for add-ess bytes and...
**Store
                                                                                    9.65
                                                                                                                                                                                                                                                                                                                                  0047 81
0049 26
0040 6F
0040 80
004F 90
4851 87
0092 60
                                                                                                                                                                                                                                                                                                                                                                                                                       CAPA
SHE
CLAP
SSE
SLEPA
STAPA
                                                                                                                                                                                                                                                                                                                                                                                                                                             LORI
CESRI-U
BYTE
#2
BYTC.U
                                                                                                          +916
                                                                                                                                          LORZ
0094 33
00% 39
                          0,2
```

```
HEN HEAPTE REA
                                                               BSB
5788
BSB
STRA
80753 BD
60735 RJ
60753 BD
60753 RJ
                                                                                Read start address (frish),...
...ard stare
Pead start address (low),...
...ard stare
                                                                                                                                                                                                                                                                                                                                           240-940 TC-3 181701
                                                                                                                                                                                                                                                                                                           (rev.2-25-81)
(rev.3-12-81)
 450 AF CA
                                                                LBN
                                                                                 MITE U
                                                                                                          Inistrative expens south
8050 80
                                                               19
                                                                                  OVTE
                                                                                                           Get data
                                                                                                          Adjust byte count
If last byte - verfy checksu
                                                                                                                                                                                                                                                                                                            Mish wood the 4000 boud! Thre MRITE William for PC
Products, Inc. TC-3 Rubbs Cossette Interfere.
                                                                                  DYTE-U
LOA4
  0035 6A
0061 27
 0063 R7
0069 R1
0067 26
                                                                STIME
COMM
DOE
                                                                                0, 2
0, 2
1,000
                                                                                                          Otherwise store data and ...
...verify correct starage
If not + error
                                                                                                                                                                                                                                                                                                       . 1/0 FORD PROPERSES FOR TO-1 (FLITER TO SULT)
                                                                1911
                                                                                                                                                                                                                                                                                         COMP FITTH EAU SCOM PIA DATA REG, SCOR.
 8669 36 E2
8868 35 F9
                                                                                                           Undate address pointer...
                                                                                F-083
 9960 4C
9965 27
                                                                                 COSP U
                                                                                                           worth meteo
                                                                                                                                                                                                                                                                                                       . EXTERNAL EQUATES (IN SEUG MONITOR)
                                                                IIC
ES
                                             LONG
                                                                                                                                                                                                                                                                                                                                                                   POLICE RE-DIMEN POINT (RETER TO SULT)
POLICE STRING POINTED AT BY 38" (13), EDT (04)
CET THO POORS, FROM USER (TO VO.18)
                                                                                                                                                                                                                                                                                                                                          STOPE
STOPE
STD20
                                            LOPE
                                                                                                           Stores Cre-
 9971 J
                                                                911
971
                                                 Pote
                                                              Inna SanaAire
                                                                                                                                                                                                                                                                                                                        ASCLI COLATES
 6673 ED
6673 46
6676 46
6677 46
8678 46
                                                               BISTA
PISTA
PISTA
PISTA
PISTA
                                                                                                           Get hex value - high
Adjust data to high order mobile
                                              ENTE
                                                                                  [Hebt
                                                                                                                                                                                                                                                                                                      CR
EDT
BEL
                                                                                                                                                                                                                                                                                                                                          M 60 4 7
                                                                                                                                                                                                                                                                                                                           CDU
                                                                                                                                                                                                                                                                                                                          (a)
                                                                                                                                                                                                                                                                                                      . STACK REER UNFINELE STORAGE

LIGHTON BRIEF OFFICE From user stack (US)
9879 UF #540
                                                                THE
                                                                                                          Preserve in B-Register
                                                                BSR
                                                                                                                                                                                                                                                                                                                                                                   bit count (1 byte)
fishi-bit checksum (1 byte)
bestmind address (2 bytes)
Ending address (2 bytes)
97V OF BYTES MESERADO DE SYMEK
677C SC 55
                                                                               11000
                                                                                                         Get her value - Iou
                                                                                                                                                                                                                                                                                                      HAMB
C'SUM
BEGA
BICA
Stat
                                                                                                                                                                                                                                                                                                                          nen
  107E 34 04 FRED
                                                                                                          Combine high and low mobiles
 60072 1F
07073 EM
17077 E7
                                                                16E
6009
5160
                                                                                                                                                                                                                                                                                                        . HO ORG SPECIFIED; CAN BE ORG'D ANAMERE.
                                                                 815
 0002 31
                                               Read Hex Subroutine
                                                                                                                                                                                                                                                          18 95 9000
                                                                                                                                                                                                                                                                                                        MEGIN IND HIME
                                                                OFFI
SLOW
SHE
 (C) (MOS)
                                                                                                           Road one RSC11 character
                                                                                 IIIC | 10
                                              11000
                                                                                   1100
                                                                                                           Convert to hex
Not hex-MSCII if results ( 8
                                                                                                                                                                                                                                                                                                                           FCB
                                                                                                                                                                                                                                                                                                                                       3
                                                                                                                                                                                                                                                          6002 63
                                                                                                                                                                                                                                                                                                                                            -SLEE(S) Set up variable std. area on start
SLEE
FIGUI-PCP
PSTREG
INCOME Inval address range to VELXR
EEGP-U
 18 PGS
                                                                889
[10]]
                                                                                                          Determine if hex-RSCII (A-F)
                                                                                                                                                                                                                                                         0003 32
0000 1F
0000 00
000E 80
0011 1007
                                                                                                                                                                                                                                                                              70
4)
80 6800
FEAE
FD20
                                                                                                                                                                                                                                                                                                                           LEAS
TFR
LEADX
JSR
JSR
JSR
STV
                                                                                                                                                                                                                                                                                                         1010
6674 Bt
6776 29
                                                                                 11072
                                                                COPP
OGT
                                                                                  0010
                                                                                                                                                                                                                                                         0014 RF 64
0010 10PC 64
0019 25 66
0018 32 66
0010 20 C1
                                                                                                                                                                                                                                                                                                                                            DEALU
ENGA,U
STEETS
STEETS
MEGIN
                                                                                                                                                                                                                                                                                                                           FTK
                                                                                                                                                                                                                                                                                                                           CHPV
BCS
LEAS
BRR
                                                                                                                                                                                                                                                                                                                                                                    December invalid can
B.K. if Bed. c End
Eise, fix as stack
and restart
OT 10 97
                                                                5289 47
                                                                                                           Ves - adjust value
 TT 27
                                              11011
11012
                                                                HTS
SVI
                                                                                                           Return
***Nex-RSCII Error**
                                               · Ineut
                                                                                                                                                                                                                                                         0015 30
0023 00
0024 75
0029 04
0028 07
002E 04
0030 07
                                                                                                                                                                                                                                                                                 EDITE
EDITE
EDITE
EDITE
EDITE
                                                                                                                                                                                                                                                                                                                          PLEAST TOWN
                                                                                                                                                                                                                                                                                                                                            RSG2 PCF
                                                                                                                                                                                                                                                                                                                                           PSTOG
CTLA
P2
PSTA
PSTA
PSTA
S1LA
                                                               P96
 GFT 34 GH
                                              H120
 000 00
004 30
000 00
000 00
000 30
                                                                050
R.1
850
850
R.1
                                              REES
                                                                                  お下行のは
                                                                                                                                                                                                                                                                                                                                                                    Enable Park PIR
                                                                                                           Pow goan bit girow
If false start...
...tru dagin
                                                                                                                                                                                                                                                         9037 76
90 909
90 909
90 909
90 909
                                                                                                                                                                                                                                                                                                                          Figs
628
(628
Dec
                                                                                                                                                                                                                                                                                                                                            HUT
                                                                                                                                                                                                                                                                                                                                                                   4-120 10mm
 00PC C6
                                                                LONG
                                                                                                           Initialize but court and...
 960C E7
                                                                9A12
                                                                                  14.00 U
                                                                                                                                                                                                                                                                                                                                            UTUL
                                                                                                                                                                                                                                                                                                                                                                   Loor until sero
                                                                                                          ...data value register
                                                                                                                                                                                                                                                          40 X 00
1X 00
                                                                                                                                                                                                                                                                                93
75
                                                                                                                                                                                                                                                                                                                                                                    Write "RE" (Bettering of $134) then
                                                                                                                                                                                                                                                                                                                           1,044
                                                                                                                                                                                                                                                                                                                                            0483
LR18
                                                                                                         Delaw one bit time
Shift for new bit
What is bit status?
If 'Of a continue
#1" a set bit
                                                                128
128
128
128
 100 (00)
100 (00)
100 (00)
100 (00)
100 (00)
                                                                                DELY
                      18
                                             KC12
                                                                                 2 HOLD
                                                                                                                                                                                                                                                         8849 AF
8842 FE
8844 38
                                                                                                                                                                                                                                                                                                                           4
                                                                                                                                                                                                                                                                                                                                            COUP, U
                                                                                                                                                                                                                                                                                                                                                                    Zero aut resease
Set menory pointer
Reant reinter
                                                                                                                                                                                                                                                         8040 00
8040 66
8044 ID
8040 66
804E 66
8050 A7
8052 AC
8054 26
                                                                                                                                                                                                                                                                                                                                                                    Increment Poshlor
Get bute
Write bute on time
Recover bute...
Add it into checksum...
And save checksum
bone set?
Ir not, write next bute
                                                                                                                                                                                                                                                                                                                          LORR
USA
LORR
LORR
RODA
STRA
CPX
BME
0000 ED 97
                                                                85h
                                             KC13
                                                                                DELY
                                                                                                          Delaw one bit time
                                                                                                                                                                                                                                                                                                                                           9,X
URTP
9,X
CSUM,U
CSUM,U
EHDM,U
UTUZ
                                                                nec
ner
                                                                                                          If not finished...
985C 68 44
995E 7E F3
88C8 33 84
88C2 39
                                                                PLLB
RTS
                                                                                                           Restore the B-register
Return
                                              * Delay Subroutine
                                                                                                                                                                                                                                                                                                                          LDAN
                                                                                                                                                                                                                                                         9056 RG
9058 80
                                                                                                                                                                                                                                                                                                                                                                   Else, but checksum on tare
                                              MEN
88C5 RF 44
                                                                                                          Presente X-resister
                                                                                                                                                                                                                                                                               RD BRCE
FORE
34
64
FR14
                                                                                                                                                                                                                                                                                                                          LEAR
198
TER
LEAS
NO
                                                                                                                                                                                                                                                         005H 38
005E 80
0061 1F
0063 32
0065 7E
                                                                                                                                                                                                                                                                                                                                          PELL POR
PSTIPHS
                                                                                                                                                                                                                                                                                                                                                                   DEY
DOF
NTS
00CF 24
00CF 7E
00CE 39
                                                                                                                                                                                                                                                                                                                                           U.S
SIZE,S
PVE
                       IF
FC
44
                                             0EL |
                                                                                                          Restore X-register
Return
                                                                                                                                                                                                                                                                                                       .
• Write Subroutine
                                              • Frewency Counter Subroutine
                                                                                                                                                                                                                                                        OBLE SA
OBLE SA
OBLE CA
OFFO E7
                                                                                                                                                                                                                                                                                                                          PSAB
PSAB
LOVE
STREET
                                                                                                                                                                                                                                                                                                       WED
                                                                                                                                                                                                                                                                                                                                                                    Sale B redictor
Oracle (sedant
Sale B redictor/
Set bit court + p
0007 34
0003 of
0002 45
0003 F4
0008 C4
0008 27
0000 27
0000 27
0000 27
0000 27
0000 27
0000 27
                                                                                                           Sone date in Arresister
Close court
Increment court
Tost Input part A
                                              DO
                    60
                                                                PSON
CLRO
INCP
LONG
PROD
CTPD
MED
STRO
STRO
SAMA
                                                                                                                                                                                                                                                                                                       MITE
                                                                               PRTA

6)

SREF U

6819
                                                                                                                                                                                                                                                                                                                                           100 U
                       91
67
76
43
19
                                                                                                        9972 SD
9974 SD
                                                                                                                                                                                                                                                                                                                                            Create start bit
                                                                                                                                                                                                                                                         807% ED
907% ED
907% ED
9077 ED
907E 28
9000 ED
                                                                                                                                                                                                                                                                                                                           BETA
                                                                                                                                                                                                                                                                                10 01 012 022 17
                                                                                                                                                                                                                                                                                                                                            1
                                                                                                                                                                                                                                                                                                                                                                      Ordale surch
Test the data bit
                                                                                                                                                                                                                                                                                                                          DE NOCO
                                                                                                                                                                                                                                                                                                                                                                     Complement output for a one...
                                              * Bit Status Sabroutine
MES FA
MEA CA
MEA CA
MEA EP
MET TO
ME
                                                                                 PETA
01
SED (U
CDGE
CDGE
STMI
CDGE
CDGE
                                              STRT
                                                               Set up SEP with correct...
                                                                                                                                                                                                                                                                                                                                                                   Decrement bit count
if 8 bits done. exit
Shir dota riGH for a
De newt bit
                       E 61 47 CE 4 8 8
                                                                                                                                                                                                                                                                                                                                            HUTD. 1
                                                                                                          ---
                                                                                                                                                                                                                                                                                6
                                                                                                                                                                                                                                                                                                                                            WIL
                                                                                                                                                                                                                                                        777 80
770 80
770 77
866 77
                                                                                                                                                                                                                                                                                                                          BSR
BSR
PLLB
RTS
                                                                                                                                                                                                                                                                                                       URT2
                                                                                                                                                                                                                                                                                                                                                                   Breats stor bit
                                                                                                           "I" timing adapts
                                                                                                                                                                                                                                                                                                                                                                     Restore 8 register
Return
                                              STAI
                                                                                                                                                                                                                                                                                                       · Create bit stream
                                                                                                                                                                                                                                                        6072 76 62
6072 78 64
6077 78 66
                                                                                                                                                                                                                                                                                                                                           PRITA
62
CLAO
SETO
                                                                                                                                                                                                                                                                                                       œ.
                                                                                                                                                                                                                                                                                                                          LOFE
Listing Continued P-21
                                                                                                                                                                                                                                                                                                                                                                    If set...clear st
```

'68' Micro Journal

THE CA FD	CLRO	LA-COS LTCAMO (SAPA	PRIM BOFD	Do double delay for surcess Clear outset bit	8814 #F 8816 19F 8819 29	42 6 42		STILL CHPV BCS	DER.U STRET	U.K. If Best (End
20 09		ST AE	PETA	Do sindle doller	001B 32	EI		LDG	SIZE.S BEGIN	Else rectors 9
F6 E000 CR 02	SETO	LDAG	62	Set adout bil	001F 38	60 013F	STREET	LOR	PEREZ. POR	
F7 E006		BRA	DLHY	Ant to result to time	665.22 6D	FBRE 75		JSR BSR	PSTONG VE.ED	Initialize PIA and write leader
C6 17	DLAY	LLEGE	**12	*** THIS CONSTRUCT DETERMINES BALD RATE ***	9929 96 9924 BA	02 EDGE		CESSE	PER P	Leave leader in 'high' state
				*** USE \$12 FOR 24886., \$89 FOR 48886. ***	8838 RE 8832 RF	C4		LDX STA	DECEN-U	
1 5A 2 26 FD 4 39		ENE RTS	DLRY+2	Loop until zero	0032 FF 0034 EC 0036 FC	46 42 46	MOM1	LDD	U.RGG	Calculate record bute count
	****	RTS		Return	9938 196 9930 25			9.80 070 8CS	ALTEN TA	If druoter than 16
5 06 26	DFA5	LOFE	4976	*** THIS CONSTANT DETERMINES BALD RATE *** *** USE \$26 FOR 24885. 814 FOR 48855. ***	SEE 66	*	KCM2	LDR	615 1003	andere lå.
7 5A	******	DECR			9949 9D 9942 A7	94	KCM2	RDOR STR	evic.u	Adjust count for address butes
8 26 FD 8 39		ENE RTS	DLY2*2	Loor until zero Return	9944 69 9846 R7	49		SUBA	NATE.U	
	· STI	RINGS		NAME OF TOTAL	9848 86 9848 17	60		LDA	999D MEVT	Generate CR
					9840 86 984F 17	9A 0072		LBSR	BSBR WEVT	Constate LF
					9852 86 9854 17	22		LBSR	6°5	Generate "S"
					18 P	3)		LBSR	4-1 WEV7	Generate ";"
					9950 37	49		CLAB LEAX	BYTC.U	Clear checksum Output record byte count
					17	S		LBSR	KENT	
PRUD IC-3 WRITE PD P. (.C.	ER		3-12-01	752 6809 PSPB. PPUE 3	9862 38 9864 17	46 60%		LERK	KEPI.U	DAPA record start address
		***	10.00		6967 17 6868 FE	44		L#59	ICTI	
88 80 28 28 20 48 69 67	MICE	FCC	LF.OR.***	High Seed TC-3 Tare Writer ***.LF.LF.CR	996C 17 996C 17	46 6075	KCU4	LUSSE	HEEN-U	Duteut record butes
68 29 53 79 65 65 64 28 54 43 20 33					4971 26	F9		348 390	NOW!	titl record ramplete
20 54 41 78 43 20 57 72					0073 AF 0075 53	46		STK	XTER.U	Preserve next address
69 74 65 77 R 20 20 20 00					9876 34 9878 1F	61		296 197	8	Calculate and outrut
50 50 44 52		FCC	151001 00	CORDER, and input range to be written: ".EDT	887A 17 887D 35	0000		LOSE PALS	S,X	checks up
5 54 20 52 45 9 43 4F 52 44		100	- III	The state of the s	₩77 Æ	46		LDX	XTEM.U	Delegation of all seasons
65 52 2C 20 61 6E 64 20					9697 28	IF		LIBROL	WENT	Deluveine if all data
69 6E 70 75 74 29 72 61					8883 PC 8888 25	42 #0		DE	SEDA. LI	If not
D 6E 67 65 20 1 74 6F 20 62					6067 66 6009 60	33		LDA BSR	e'S VEVT	All done DiterA "5"
5 65 20 77 72 P 69 74 74 65					6550 %	37		LDA	erg MENT	0,000
D 6E 3A 78 B4					600E 29	SD SIRM		LERK	BELL PCR	Signal finished
1 00 00 00 4F 5 48 2E 20 44	MSG2	FCC	LF.CR.LF.	*OK, Due in growthel*,EUT	9873 E	FORE		198	PSTEG	by enmitte bell
9 75 60 78 28 0 69 6E 28 78					98% 1F 8898 12	34 68		TFR LEAS	U.S SIZE.S	Guarantee a tidy exit, stack-wise
1 72 46 67 73 9 49 73 73 万					阿那 飞	FEL4		THP	BME.	and return to SEG (OR MERCES)
0 3E 3E 90							PIR			Leader Subroutine
ec 67 60 66 64	BIL	FOC	PEJ, . 0 . 0 . 0	101	10790 7F 10740 96	6004	G.N	CLS	CLTT#	Initialize PIR Set date direction
		Đ¢	MEGIN		CENT2 67	Eeee		SLA	PRITE -	Enable port
POPES PETELTED					88F5 96 88A7 87	10.00		STR	CTLA	and and the state of the state
					S ARBO	BEFF	MEI	LDOC BS-R	WINE WIEW	Comprete leader
		Manc	KISPIC 40		CORTO SD		WE3		~1.1t	
		HPK TIL	101910.659 6007 65 M	י אוופו (פר דל-3	980 1 26	SF FR	WE I	BAE	MLEZ.	
		17L 091			FEET 30	1F		RTS	TES	Return
47		n,	6007 IS IS		607F 30 9001 26 608C 39	3F FR	: Data	RTS Bit Out	NLEZ Irul Subro	Aire
41		11L 0P1	6007 ES 18 PRG 1900		980 1 26	1F		RTS	TES	
#f	. (144.	17L 0P1 or 12. 3-12-81	6007 6% M PRG 1900	plies (ar tt-3	6077 30 0001 25 608C 39	1F FA	: Data	BIE OU	NLEZ Irut Subroi A.B	tire Entry for '8' data bit output
47	. (144.	17L 0P1 or 12. 3-12-81	6007 6% M PRG 1900		0001 26 0001 26 0002 39	3F FR	: Data	BIT ON	uLEZ trut Subro (I.II 14	itine Entry for '8' data bit output 1788 My. Baud count
¥f	Kansa	17L (P1 3-12-01 H City	6007 6% M PRG 1900	PITER for TC-3 RITER for JPC 1C-3 ACR Interface	6007 30 6001 26 6002 39 6004 54 6004 C6 6000 66 8000 20	96 94 39	: Data	BILL OUT FING LINE LOP GER PING	#LE2 Put Subrox #1.8 #4 #109 #811 #1.8	Aline Entry for "8" data bit output 1788 Pg. Basic count WHOTE: THIS CONSTRUCT DETERMINES FREEHIDGE Entry for "1" data bit output
	Kansa	091 091 3-12-01 ss City	6007 (C) 16 PRG 1900 1	PINE for TC-3 RITER for JPC TC-3 PCR Interface TC-3 PIN DATE ROSS, PCRR.	0007 30 0001 25 0002 39 0004 34 0004 C5 0000 06 0007 20 000C 34 000C C5	96 64 30 66	• Data	BIE OUT PSG LSE	4LE2 Fut Subrox 6.8 64 9109 4911 6.2 98	dine Entry for "8" data bit output 1788 Mg. Baut count
0000 E007	Kansa L/O F PRIR CTL/A	091 091 3-12-01 100 100 100 100 100 100	6007 KE M PRG 1900 1 Standard M RESSES FOR	PITER for JPC 1C-3 ACR Interface TC-3 PIN DATA RES. ACR. PIN CRETTER. RES. ACR.	6001 26 6001 26 6002 39 6004 34 6006 C6 6000 06 6007 20 6002 54	96 64 39 66 64 27	MBIN MBIN	BIE OUT FING LINE LOP GROP FING LOP LOP LOP LOP LOP LOP LOP LOP LOP	#LE7 Put Subrox #.8 #4 #100 #011 #.8 #0	Aline Entry for "8" data bit output. 1788 Mg. Bout count
E009	Kansa L/O F PRIR CILA EXTES	OPT 12-3-12-01 H CITY FOR EQUIPMENT FOR EQUI	6007 ISC M PRG 1900 3 Standard M RESSES FOR	PITER for JPC TC-3 PCR Interface TC-3 PIN DRTH RGG, REUR. PIN CENTER. RBG, REUR. PIN CENTER. RBG, REUR.	6875 30 6801 25 6882 37 6806 55 6882 66 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 6886 65 686 65 686 65 686 65 686 65 686 65 686 65 686 65 686 65 686 65 686 65	9F FR 96 94 39 86 88 27 45 82	• Data	BME RTS Bit Out FSMG LSM LSM LSM PSMG LSM PSMG LOR LOR LOR LOR LOR LOR	#LE7 ###################################	Aline Entry for "8" data bit output. 1288 Mg. Baut count
E007	* Kansa * 1/0 F PRIR CILA * EXTES	091 091 091 091 091 091 091 091 091 090 090	1900 1 Standard M MESSES FOR MESS FOR MESS (SRUG MFB14 MFB14 MFB14 MFB14 MFB14	PITER for JPC 1C-3 ACR Interface TC-3 PIN DATA RES. ACR. PIN CRETTER. RES. ACR.	6875 30 6801 25 6882 37 6885 38 6886 55 6888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8888 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 8880 66 86 86 8000 66 8000 66 8000 66 8000 66 8000 66 60 60 60 60 60 60 60 60 60 60 60	96 94 38 96 96 96 96 98 27 43 82 E808 E808	· Data · Bata · Bata · Bata · Bata	BME RTS Bit Out FSPG LSB	MLEZ 4.8 94 94 94 95 96 96 96 96 96 96 96 96 96 96 96 96 96	Aline Entry for "8" data bit output. 1200 Mg. Baud count WHOTE: THIS CONSTANT DETERMINES PREMERCY Entry for "1" data bit output. 1400 Mg. Baud count. ***********************************
E009	* CHU. * Kansa * 1/0 F PRIR CILA * EXTER BVE PSTRING 11/2/0R	OPT 12. 3-12-01 IN CITY FOR THOSE EQUIPMENT FOR EQUIPMENT	6009 KC M PRG 1900) Standard M RESSES FOR HERS HERS FOR FOR PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE PROPE	PITER for JPC TC-3 PCR Interface TC-3 PIN DRTH RGG, REUR. PIN CENTER. RBG, REUR. PIN CENTER. RBG, REUR.	6875 30 6801 25 6882 37 6886 55 6888 66 6888 66 6888 66 6888 66 6888 66 6888 66 6888 66 6888 66 6888 66 6888 66 6888 66 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6888 6880 6888 6888 6880 6888 6888 6880 6888 6880 6888 6880 6880 6880 6880 6	3F FR 06 04 30 06 06 08 27 43 82 82 82 82 82 83	WBIS WBIS WBIS WBIS WBIS WBIS WBIS WBIS	BME RTS Bit Out FING LINE LUP BITH LUP	4LE2 Put Subroi A.B 44 9108 4911 A.B 99 9825 DELT.U 92 9978	Aline Entry for "8" data bit output. 1288 Mg. Baud count
FQ14 FD#E T920	* Copy. Kansa 1/0 F PRIN CTLN EXTER BVE PSTRING 11:240R - #SCII	OPT OPT 12. 3-12-01 H. CITY PORT HOD BOU EOU EOU EOU EOU EOU EOU EOU EOU EOU E	6009 KC M PMG 1900) Standard M MESSES FOR MESSES FOR MESSES MESSES FOR MESSES FOR MESSES MESSES FOR MESSES FOR MESSES FOR MESSES FOR MESSES FOR MESSES FO	PITER for JPC TC-3 PCR Interface TC-3 PIN DRTH RGG, REUR. PIN CENTER. RBG, REUR. PIN CENTER. RBG, REUR.	6007 34 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000 125 6000	96 64 38 86 86 88 27 43 82 E868 45 FD	· Data · Bata · Bata · Bata · Bata	BME RTS BIT OUT PSMG LSM LSM LSM LSM PSMG LSM PS	MLE2 PUL Subrou ALB 94 e108 4811 ALB 90 e123 DELT.U 02 POTA POTA DELT.U 4813	Aline Entry for "8" data bit output. 1288 Np. Band count WWW HOTE: THIS CONSTRUCT DETERMINES FREEHING. Entry for "1" data bit output. 1489 Np. Band count. WWW HOTE: THIS CONSTRUCT DETERMINES FREEHING. Property data time Committee vector ways "With Promisers "What to DELT. Onlar
FQ14 FD#E 1020	EXAMPLE OF THE PRINCIPLE OF THE PRINCIPL	OPT 12. 3-12-01 H CILW FORT HOD BOU EQU EQU EQU EQU EQU EQU EQU EQU EQU EQ	6009 EC M PRG 1900) Standard M RESSES FOR RESSES (SRUG OFD14 PRDF6 PRDF6 PRDF8 SCORE OFD OFD OFD OFD	PITER for JPC TC-3 PCR Interface TC-3 PIN DRTH RGG, REUR. PIN CENTER. RBG, REUR. PIN CENTER. RBG, REUR.	600 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1 25 6000 1	96 94 38 96 96 98 27 45 82 E998 E998 45	WBIS WBIS WBIS WBIS WBIS WBIS WBIS WBIS	BUE PITS BIT OUT FING LINE LOR GROW FINGS LOR LOR STR LOR DESTR LOR OCCUR BUE LOR BUE	MLE2 ALB 44 4400 4611 ALB 90 67.25 62 67.10 60.17.0 4013 42 7777	Aline Entry for "8" data bit output. 1288 Mg. Baud count
FO14 FOME 1020	* Cepu. Kansa 1/0 / PRIR CILA EXTER BVE PSTRING INCHOR - ASCII UF CIT CIT CIT	OPT 12. 3-12-01 HE CITY PORT HOD BOU EQU EQU EQU EQU EQU EQU EQU EQU EQU EQ	6009 KC M PRG 1900) Standard M RESSES FOR HERS HESS (SRUG HERS HESS (SRUG HERS HERS HESS (SRUG HERS HESS (SRUG HERS HERS HESS (SRUG HERS HERS HERS HERS HERS HERS HERS HERS	PITER for JPC TC-3 PCR Interface TC-3 PIN DRTH RGG, REUR. PIN CENTER. RBG, REUR. PIN CENTER. RBG, REUR.	600 1 25 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2 5 600 2	96 64 38 86 86 88 27 43 82 E868 45 FD	MBIN MBIN MBIN MBIN	BME RTS BIT OUT FING LINE LOR BITS LOR LOR STA LOR OFFING LOR BUTT STA LOR OFFING LOR OFFING STA LOR	MLE2 PUL Subroi ALB 94 9408 4811 ALB 99 98,25 DELT, U 92 POTA POTA POTA POTA 12 12	Aline Entry for "8" data bit output. 1288 Np. Baud count WWW HOTE: THIS CONSTANT DETERMINES PREMIENCE Entry for "1" data bit output. 12480 Np. Baud count was NOTE: THIS CONSTANT DETERMINES PREMIENCE Proserve datas time Commission to POLT. Obline Commission for salars were Commission for salars were
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I've heard of the TC-3 being used at up to 9600 baud, but I found optimum reliability at 2400 baud. This allows Mike to load TSC 6809 BRSIC (10K+) in under two minutes, compared to nearly 20 minutes at 300 baud.

ADVENTURE MARK DATA

A REVIEW

PAUL E. PHELPS 111 DIVISION ST. 19 KING CITY, CALIF 93930

I admit to being Fleased with to review opportunity these two new additions to the rather limited 'Adventure' senre. When I called Mark Data Products to order the first of the games, Island" and discovered I was receiving it and the second in the series, I could only wait with bated breath for the disk to arrive. Arrive it did and after several fun filled and challenging hours, I was able to solve the ruzzels. Compared to the original these are not as commlicated, but well worth the cost and no small challenge in themselves.

"Calixto Island" involves searchind a building and series of locations for a treasure, which then must be brought back to the starting location to win. Not as simple as it sounds! The dialog seems well written and, occasionally even funny. The game movest smoothly and, because these are written in machine language, they are, to all intents and purposes, instant in response. I will give no clues to their solution. Suffice it to say that, if you purchase the disk from Mark Data Products, you won't be dissapointed in the challenge.

Personally, I liked the second adventure, "Black Sanctum" better than the first. I found it more challending and it took longer to resolve and that is after having played "Calixto Island" first and, therefore, being a bit familiar with the tactics used in designing the puzzels. Perhaps being a Chaplain has a bearing on it, but the use of Midieval imaging and 'black magic' intrigued me and I thuroughly enjoyed it. My wife and I spent a pleasent afternoon

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wandering around in search of the 'evilforce' and learning how to destroy it. Quite a challenge.

I look forward to future productions from Mark Data Products. In a phone conversation with the author, he indicated that there were other sames in the works some for adulst, as these are, but also some for younser folk too.

There is, it seems to me, a need for some of the 'fun and sames' aspects of hobby computers to be more available in our corner of the world. Mark Data Products has opened the door. I, for one, will look for many more hours of fun and challenge to walk through it (provided, of course, that I have found the key, or cleared the entrance, or

These sames are available for \$16.95 Data Products. from Mark Barquilla, Mission Viejo, California, present they come in FLEX 2.0 disk format, but would, I suspect, run equally well in any other 6800 system (except for the same "save " function, of course). They are single entities and come with adaptation notes provided by the author. They run 16k systems plus the DOS. If you decide to buy one or both, good luck on your travels! You will need it!

UNDERSTANDING SUBROUTINES PART 2 — ASSEMBLY LANGUAGE SUBROUTINES AND PARAMETERS

John F. Wakerly Micro Systems Engineering 257 Castro Street, Suite 2E3 Mountain View, CA 94041

Part 1 of this three-part series discussed procedures and parameters in Pascal. Part 2 shows how these high-level concepts relate to assembly language subroutines and parameter-passing conventions using examples in Motorola 6809 assembly language.

John Wakerly is an independent consultant and a consulting associate professor at Stanford University. This three-part tutorial on subrontines in Pascal and 6809 assembly language is adapted from his recently-published book, Microcomputer Architecture and Programming, copyright 1981, with permission of the publishers. John Wiley & Sons, Inc. (The baok is also available directly from the author at MSE Books; see advertisement elsewhere in this issue.)

JUGGLER

Recently we received a copy of the MICRO POWERS'S 'JUGGLER' game. It runs under TSC Extended BASIC® and works with the current SWTPC series of video terminals.

It is a game that requires a developing skill level and has been a hit with the office staff here. Fact is, they disabled the 'bell' code so that game playing was not quite so noticable.

For the user who needs an occasional relief from heavy programming and who might want to entertain the kids (small and large) this is a nice package.

JUGGLER may be ordered from: MICRO POWER Systems and Software, 1418 Thorndale, Chicago, IL 60660. Telephone 312 989-8585.

SUBROUTINE CALLING METHODS

In order to execute subroutines, a processor must have a means for a program to save a return address when the subroutine is called, and a way for the subroutine to jump to the return address when the subroutine is finished. Theoretically, subroutine return addresses could be handled by ordinary instructions, as shown in Table 1 for the 6809. Here the programmer has set up a convention for subroutine calling programs to save a return address in two reserved bytes at the beginning of the subroutine. Note that this convention cannot be used if the subroutine is stored in read-only memory!

TABLE 1 How to call subroutines in the 6809 without using JSR and RTS. By convention, a subroutine return address is deposited in the first two bytes of the subroutine. The first executable instruction begins in the third byte of the subroutine.

		Main program.
LDX	#RET?	Load X with the return address
STX	SUBR	and store it in subroutine.
JMP	SUBR+2	Jump to subroutine.
		Return here when subroutine done.
LDX	#RET2	Save return address again.
STX	SUBR	
JMP	SUBR+2	Jump to subroutine.
• • •		Return here when subroutine done.
• • •		
	•	
	_	Reserve two bytes for return addr.
STA	PI	First executable instruction.
	SUBR	Get return address from loc. SUBR.
JMP	,X	Jump to address contained in X.
	STX JMP LDX STX JMP RMB STA 	STX SUBR JMP SUBR+2 LDX #RET2 STX SUBR JMP SUBR+2 RMB 2 STA P1 LDX SUBR

Because subroutines are used so often, all modern processors have special built-in instructions for calling subroutines and returning from them. A pushdown stack is the most appropriate data structure for saving subroutine return addresses, because it can store more than one return address when subroutines are nested. The number of levels of nesting is limited only by the size of the stack.

Most processors have a dedicated register (SP) that points into a stack of subroutine return addresses. The subroutine calling instructions (JSR or CALL) push return addresses onto the stack, and subroutine return instructions (RTS or RET) pop return addresses off the stack.

In the 6809, the JSR and RTS instructions provide for subroutine calls and returns in conjunction with the stack pointer register SP. Any program that uses subroutines is required to reserve a small area of memory for a push-down stack for return addresses. At the beginning of such a program SP must be initialized to point at this area using the LDS #addr instruction. As shown in Figure 1, SP points to the top item in the stack, or just past the stack area if the stack is empty. SP is decremented once before storing each byte on the stack, and incremented once after popping each byte. A return address occupies two bytes.

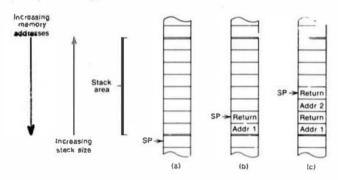


FIGURE 1 6809 return-address stack: (a) empty; (b) after one subroutine call; (c) after second (nested) subroutine call.

Table 2 outlines a Pascal program with two nested subroutines and the corresponding assembly language statements.
The JSR addr instruction saves the address of the next instruction by pushing it onto the stack and then jumps to the instruction at location addr, the first instruction of the subroutine. At
the end of the subroutine, RTS pops an address from the stack
into PC, effecting a return to the original program sequence.
Figure 2 shows the state of the stack after each instruction that
affects it.

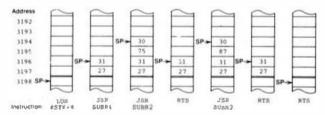


FIGURE 2 Stack contents after executing instructions in Table 2.

TABLE 2 A program with two nested subroutines. Both Pascal and corresponding 6809 assembly language statements are shown.

ADOR CONTENT LABEL OPCDE OPERAND COMMENTS

			ORG	\$3000	PROGRAM SubrExamples:
3000		SUBR2		43000	PROCEDURE Proc2:
					BEGIN
3055	39		RTS		END:
		•			
3056		SUBRI	•••		PROCEDURE Proct;
• • •	• • •				BEGIN
3072	BD 3000		JSR	SUBR2	Proc2; [Call Proc2]
3075		RET2A			•••
					•••
3084	BD 3000		JSR	SUBR2	Proc2; {Call Proc2
3087	• • •	RET2B	•••		again)

3092	39		RTS		END;
		•			
3093	0F 3198	AIN	LDS	#STX+4	BEGIN (Main program)
3124	BD 3056		JSR	SUBR1	Proc1: [Call Proc1]
3127		RET1			
3191	7E 1000		JMP	\$1000	END.
		•		71000	
3194	(0004)	STK	RMB	4	Reserve 4 bytes for
3198			END	AIN	two return addresses)

Processors that don't have a hardware stack pointer, such as the Texas Instruments 9900, have subroutine calling instructions that save the return address in a specified processor register. When subroutine calls are nested, it is up to the programmer to save the contents of this register in dedicated memory locations or in a stack.

SUBROUTINE PARAMETERS

In Part I we discussed several types of parameters used in Pascal procedures and functions. Table 3 shows the corresponding parameter types in assembly language subroutines.

TABLE 3 Parameters in Pascal and assembly language programs.

Pascal	Assembly Language Parameter Type
Parameter Type	rarameter Type
Value	Data value
Variable	Address of variable
Procedure or	Address of procedure
function name	or function

The parameter types specified in Pascal procedure and function definitions should be called *input parameters*, because they are passed from a calling program to a subroutine. However, subroutines can also pass results to a calling program. For example, a Pascal function returns one value to the calling program, while an assembly language subroutine can return many values. We'll call these values *output parameters*. *outputs*, or results.

To see the difference between variable parameters and value parameters, compare the swapping procedures in Table 4 and Table 5. In the first example, the main program passes the subroutine the addresses of the two variables; the subroutine accesses the variables by indirect addressing. In the second example, the main program passes copies of the variables to the subroutine, which the subroutine manipulates directly; the subroutine has no way to get at the original variables themselves.

TABLE 4 Swapping subroutine using variable parameters.

•	Swap	two 8-bit	variables x and y whose addresses
•	are p	passed in	index registers X and Y.
SWAP	LDA	, X	Put x and y into A and B.
	IDB	. Y	
	STA	, Y	Save A and B into y and x.
	STB	, X	
	RTS		
•	Main	program	swap the values of VARP and VARQ.
MAIN			
	LDX	#VARP	Load X with address of VARP.
	LDY	#VARO	Load Y with address of VARQ.
	JSR	SWAP	Swap values of VARP and VARQ.
VARP	RMB	1	Reserve storage for VARP and VARQ.
VARQ	RMB	1	

TABLE 5 Swapping subroutine using value parameters.

```
Swap two 8-bit values passed in regs A and B.
SWAP
       STA
             TEMP
                       Save value of A.
       TPR
             B.A
                       Transfer B to A.
             TEMP
                       Put saved value of A into B.
       1.DB
       RTS
                       Local variable.
TEMP
       RMB
             1
       Main program -- swap copies of VARP and VARQ.
MAIN
       LDA
             VARP
                        Load A with value of VARP.
                        Load B with value of VARQ.
       LOB
             VARQ
                        Swaps copies of VARP and VARQ in
             SWAP
       JSR
                        A and B, originals are untouched.
                        Reserve memory for VARP and VARO.
       RMB
VARP
       RMB
```

The "Load Effective Address (LEA)" instruction found in many processors is very useful for passing variable parameters. This instruction loads an index register with the address of an operand, using a specified addressing mode. Suppose that a programmer wanted to swap VARP and SCORE[J], where SCORE[0..99] is an array of 100 bytes. Then the following main program statements in Table 4 would do the trick:

```
LDX
             VARP
                        X now has address of VARP.
       LDY
                         Get index of array item J.
             SCORE, Y
       LEAY
                         Y now has address of SCORE[J].
       JSR
             SWAP
                        Storage for array index.
       RMB
SCORE
      RMB
             100
                        Storage for 100-byte array.
```

Here the LEAY instruction loads Y with the address of SCORE[J] as computed at run time—the sum of J and the base address of the array SCORE.

From these examples, it is apparent that all parameters in assembly language programs are really "values." With "variable" parameters, the "value" that is passed just happens to be the address of a variable. How parameters are classified doesn't make much difference, as long as the subroutine and calling program agree on how the parameters will be used.

PASSING PARAMETERS IN REGISTERS AND MEMORY LOCATIONS

The simplest way for a program to page parameters to a subroutine is to place them in the processor's registers. Likewise, the subroutine can return results to the calling program in the same way. This technique was used in the subroutines in the previous section. Of course, the programmer must ensure that the calling program and the subroutine agree on which register contains each parameter. The register allocation for parameters is usually stated in a comment at the beginning of the subroutine, as in the foregoing examples.

If a processor does not have enough registers to hold all of the input or output parameters of a subroutine, then dedicated memory locations may be used instead. These memory locations are associated with the subroutine itself, not the calling program, so that each calling program places inputs and retrieves outputs in the same pre-arranged locations. For example, the 6809 DIVIDE subroutine in Table 6 expects the caller to place input parameters in locations DVND and DVSR, and it places outputs in locations QUOT and REM.

PARAMETER AREAS

It is also possible to associate a parameter area with the calling program instead of with the subroutine. In this case, the

TABLE 6 6809 DIVIDE subroutine that passes parameters in dedicated memory locations.

```
SUBROUTINE DIVIDE
       Divides a 16-bit unsigned number by an 8-bit
       wasigned number, vielding 8-bit quotient and
       remainder. The subroutine returns calls the
       operating ayatem on overflow and on attempts
       to divide by zero.
DVND
       RMB
                         Dividend.
DVSR
       RHB
                         Divisor.
OUOT
       RMB
                         Quotient.
REM
       RMR
                         Remainder.
                         Local atorage for counter.
CNT
       RMB
DIVIDE LDA
             48
                         Initialize count.
             CNT
       STA
       LDA
             DVND
                         Put dividend in A.B.
             DVND+1
       LDB
       CMPA
             DVSR
                         Will quotient fit in 1 byte?
       BLO
             DIVI.UP
                         Branch if it will.
       SWI
                         Else report overflow to opsys.
DIVLUP ASLB
                         Left shift A,B with LSB: =0.
                         A carry here from MSB means
       ROLA
             OUOT1
                           high DVND definitely > DVSR.
       BCS
                         Compare high DVND with DVSR.
       CMPA
             DVSR
       BLO
             OUOTOK
                         Ouotient bit = 0 if lower.
OUOT1
       INCB
                         Else set quotient bit to 1.
             DVSR
       SUBA
                         And update high DVND.
OUOTOK DEC
             CNT
                         Decrement iteration count.
             DIVLUP
       BCT
                         Continue until done.
       STA
                         Store remainder.
             OUOT
       STB
                         Store quotient.
       RTS
                         Return.
```

calling program places parameters in the parameter area and passes the subroutine the base address of the parameter area. For example, Table 7 shows a new version of the DIVIDE subroutine in which the calling program uses register X to pass the base address of the parameter area. The subroutine may then use based addressing to access the parameters. In based addressing, an address register (e.g. X in the 6809) contains the base address of a data structure, while the instruction (e.g. LDB DVND+1, X) contains a constant offset (DVND+1=1) to a particular item in the data structure.

TABLE 7 6809 DIVIDE subroutine that uses a parameter area.

Input and output parameters are passed in a 5-byte parameter area. The base address of the parameter

```
area ia passed to the subroutine in X. Parameter
       positions in the parameter area are defined below.
DVND
                         2-byte dividend.
DVSR
       DOU
             2
                         1-byte divisor.
CUCT
       FOU
             3
                         1-byte quotient.
       EOU
REM
                         1-byte remainder.
DIVIDE LDA
              6R
                         Initialize count.
       STA
             CWT
       LDA
             DVND.X
                         Put dividend in A,B.
       LDB
             DVND+1.X
             DVSR.X
                         Will quotient fit in 1 byte?
       BLO
             DIVLUP
                         Branch if it will.
       SWI
                         Elsa raport overflow to opsys.
DIVLUP ASLB
                         Left shift A,B with LSB: =0.
       ROLA
                         A carry here from MSB means
       BCS
             OUOTI
                           high DVND definitely > DVSR.
       CMPA
             DVSR, X
                         Compare high DVMD with DVSR.
             QUOTOK
                         Quotient bit = 0 if lower.
QUOTI
       INCB
                         Else set quotient bit to 1.
       SUBA
             DVSR, X
                         And update high DVND.
QUOTOK DEC
             CNT
                         Dacrement iteration count.
             DIVLUP
       BGT
                         Continue until done.
       STA
             REM, X
                         Store remainder.
       STB
             QUOT, X
                         Store quotient.
       RTS
                         Local storage for counter.
```

TABLE 8 Program that calls DIVIDE.

•	_		P DIV O; PMODQ := P MOD Q;
•	W	here all are	1-byte variables in memory.
DIVPO	LDM	#PARMS	X points to parameter area.
	CLR	DVND,X	Clear high-order dividend.
	LDA	P	Store low-order dividend.
	STA	DVND+1,X	
	LDA	Q	Store divisor.
	STA	DVSR,X	
	JSR	DIVIDE	Do the division.
	LDA	QUOT, X	Save the quotient.
	STA	PDIVO	
	LDA	REM,X	Save the remainder.
	STA	PMODQ	
P	RMB	1	Storage for P, Q, PDIVQ, PMODQ
Q	RMB	1	(all 1-byte variables).
PDIVO	RAB	1	
PHODO	RMB	. 1	
PARMS	RMB	5	Storage for parameter area.

Table 8 shows a program that calls this DIVIDE subroutine. Notice how the parameter area is associated with the
calling program, not the DIVIDE subroutine. The calling program may use the same parameter area for other subroutines.
If a main program calls many different subroutines, using a
single parameter area saves memory compared with the alternative of allocating separate parameter variables for each subroutine. Of course, the parameter area must be big enough to
hold the largest number of parameters used in any one subroutine.

Parameter areas are sometimes useful for subroutines that are stored in read-only memory (ROM). Since parameter values can't be stored into a ROM, it is more convenient to allocate storage for them with their calling programs in read/write memory (RWM).

One special form of parameter area is called an *in-line* parameter area. Here the parameters are stored in the calling program immediately following the subroutine calling instruction (JSR). The "return address" stored by JSR is really the address of the first parameter. Before returning, the subroutine must bump this return address value past the parameter area; presumably, the subroutine knows exactly how many memory bytes to skip over. In-line parameter areas should only be used if the actual parameters for any given subroutine call are always constant. If the actual parameters are variables, then the in-line parameter area must be modified each time the subroutine is called, impossible in ROM and undesirable even in RWM (some memory management systems enforce write protection on program areas).

STATIC AND DYNAMIC ALLOCATION

Storage allocation methods for subroutine parameters can be classified as static and dynamic. With static allocation, memory locations are reserved for the parameters of a particular subroutine or caller, and are unused at other times. Both versions of the DIVIDE subroutine above use static allocation. With dynamic allocation, parameters are stored in the designated area during subroutine execution, but the storage is available for other uses the rest of the time. Passing parameters in registers as in Tables 4 and 5 is the simplest form of dynamic allocation.

STACK-ORIENTED PARAMETER-PASSING CONVENTIONS

Placing parameters in a pushdown stack is a form of dynamic allocation used both by assembly language programmers and by compilers for several high-level languages, including Pascal and Forth. Parameters can generally use the same pushdown stack as return addresses, since most processors have instructions to push, pop, and access arbitrary data in the return-address stack.

Figure 3 shows a typical use of a return-address stack for passing parameters. The calling program reserves space on the stack for any output parameters and then pushes input parameters onto the stack. After the subroutine is called, the stack has the state shown in Figure 3(a). An address register FP is now used as a stack frame pointer (or frame pointer). The subroutine saves the old value of FP by pushing it onto the stack and then copies the value of SP into FP. The frame pointer provides a fixed reference for accessing parameters that does not change with SP as more items are pushed onto the stack. The region of the stack accessed during a subroutine's execution is called a stack frame.

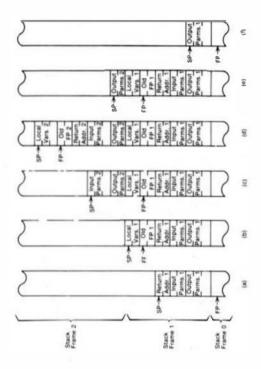


FIGURE 3 A pushdown stack with return address, parameters, and local variables: (a) just after catling SUBR1; (b) during execution of SUBR1; (c) just before a call to SUBR2; (d) during execution of SUBR2; (e) just after return from SUBR2; (f) just after return from SUBR2; (f) just after return from SUBR1.

As shown in Figure 3(b), local variables can also be pushed onto the stack during a subroutine's execution and accessed by offsets from FP. If a second (nested) subroutine is called, parameters are again pushed onto the stack and a new stack frame is created, as shown in Figure 3(c,d), As each subroutine returns, it "cleans up" the stack by

- (1) Removing its local data by setting SP equal to FP.
- (2) Restoring the old value of FP by popping it from the stack.
- (3) Removing the input parameters from the stack and jumping t the return address, leaving only the output parameters on the stack.

TABLE 9 DIVIDE routine that passes parameters on a stack.

```
The offsets below define positions of parameters
       and local variables in the stack relative to a
       frame pointer (register X).
CNT
       EOU
             -1
OLDEP
             0
                         Old value of frame pointer.
       EQU
RETADR FOU
             2
                         Return address.
DVSR
       EQU
             4
                         1-byte divisor (input) .
DVND
       EQU
             5
                         2-byte dividend (input) .
       EQU
             7
                         1-byte remainder (output) .
REM
TOUD
       EQU
                         1-byte quotient (output).
DIVIDE PSHS
             x
                         Push old frame pntr onto stack.
       TFR
             S.X
                         CODY SP to X for new frame pntr.
                         Push initial count.
       LOA
             8
       PSHS
             A
       LDA
             DVND, X
                         Put dividend in A.B.
       LDB
             DVMD+1.X
       CHPA
             DVSR, X
                         Will quotient fit in 1 byte?
       BLO
             DIVLUP
                         Branch if it will.
       SWI
                         Else report overflow to opsys.
DIVLUP ASLB
                         Left shift A,B with LSB:=0.
       ROLA
                         A carry here from MSB means
             OUOT 1
       BCS
                           high DVND definitely > DVSR.
             DVSR, X
       CMPA
                         Compare high DVND with DVSR.
       O.IR
             OUOTOK
                         Ouotient bit = 0 if lower.
CUOTI
       INCB
                         Else set quotient bit to 1.
       SUBA
             DVSR.X
                         And update high DVND.
QUOTOK DEC
             CNT, X
                         Decrement iteration count.
       BGT
             DIVLUP
                         Continue until done.
             REM, X
       STA
                         Store remainder.
             OUOT. X
                         Store quotient.
       STB
       TFR
                         Remove local variables.
             X.S
             X
       PULS.
                         Restore frame pointer.
       PULS.
             Y
                         Get return address, save in Y.
       LEAS
             3.5
                         Remove input parms (SP := SP+3) .
       JMP
                         Return to addr contained in Y.
```

TABLE 10 Program that calls stack-oriented DIVIDE.

```
Compute PDIVQ := P DIV Q; PMODQ := P MOD Q;
          where all are 1-byte variables in memory.
                        Make room for output parma.
DIVPO LEAS
            1-2,5
       LDA
                         Push low-order dividend.
       PSHS
       CLR
                        Push high-order dividend = 0.
       PSHS
             A
                         Push divisor.
       I.DA
             O
       PSHS
             A
       ISR
             DIVIDE
                        Do the division.
       PULS
                         Pop remainder and store.
             PHODO
       STA
       PULS
                        Pop quotient and store.
       STA
             PDIVO
       RMB
                        Storage for P, Q, PDIVQ, PMOOQ
       RMB
                            (all 1-byte variables) .
PDIVO
       RMR
PHODO
       RMB
```

The stack-oriented subroutine calling convention is illustrated by the DIVIDE subroutine in Table 9. Register X is used as the frame pointer. A program that calls DIVIDE is shown in Table 10. The state of the stack before the DIVIDE subroutine is called is shown in Figure 4(a). The calling program reserves two bytes on the stack for REM and QUOT and then pushes DVND and DVSR (Figure 4(b)) and calls DIVIDE. Then DIVIDE pushes the old value of the frame pointer and CNT onto the stack as shown in Figure 4(c). Upon return, the stack is cleaned up, leaving only the output parameters REM and QUOT as shown in Figure 4(d).

You may have noticed that the use of X as a frame pointer in Table 9 is somewhat superfluous since SP doesn't change throughout the subroutine's execution; we could have used SP instead of X by adding 1 to all the offsets. However, in

a more general subroutine, intermediate results of expression evaluations and other computations might be temporarily pushed onto and popped from the stack, so that parameter offsets from SP would be continually changing. In this case, the fixed frame pointer (X) is much easier to use than SP.

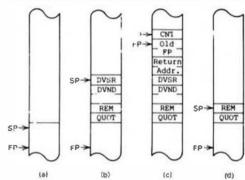


FIGURE 4 Stack contents during DIVPQ program: (a) at start; (b) just before calling DIVIDE; (c) after first four instructions of DIVIDE; (d) on return.

The DIVIDE subroutines in Tables 7 and 9 both access parameters in a "parameter area," using based addressing with offsets from X. The major difference is that the parameter area for Table 7 is allocated statically when the program is assembled, while the parameter area for Table 9 is created dynamically on the stack each time the subroutine is called. With static parameter areas we need one for each subroutine: with a stack we need only enough storage for the maximum number of parameters that are "active" when subroutines are nested. In a program with many subroutines the stack convention could yield significant memory savings.

Procedures and functions in Pascal pass parameters using a stack-oriented convention similar to the one described above. Local variables are also stored on the stack. This explains why the values of local variables are not preserved between successive invocations of the same procedure—the stack pointer may start at a different position on each invocation, so that the variables could actually be stored in different memory locations on different invocations.

ANOTHER EXAMPLE: QUEUE SUBROUTINES

To conclude this part, we give a set of 6809 subroutines that manipulate queues. These subroutines use a parameter area called a "queue descriptor table," and their documentation includes "prologues" that explain how the subroutines work. In keeping with the philosophy that programs should be self-documenting, we leave you to read Table 11.

TABLE 11 Queue manipulation subroutines for the 6809.

QUEUE MCDULE

This module has three subroutines for manipulating queues of θ-bit bytes. A queue is defined by a queue descriptor table and a storage block as shown below.

QUEUE STORAGE BLOCK

QDTBL | QHEAD (word) | ----> | (byte) |

QTAIL (word)								
QSTRT (word)								
QEND (word)								

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```
Offsets in descriptor table:
OHEAD
       EOU
             0
LIATO
       EOU
             2
OSTRT
       EDLI
OEND
       EOU
 In this table, the first two words are constants.
 initialized at load time, that give the starting and
 ending addresses of the block of storage (buffer)
* reserved for the queue itself. The third and fourth
 words are reserved to store the queue head and tail
  (which are absolute memory addresses), and are
manipuleted by the subroutines.
* If a program defines several queues, it allocates a

    separate queue descriptor table and storage block for

  each one. For example, the statements below define
 a 5-byte queue Q1 and a 100-byte queue Q2:
OTRIX RMR
                     Storage block for Q1.
O LEND EOU
             -1
                     Last location in O1 storage block.
             4
                     Q1 descriptor table: QHEAD, QTAIL.
OIDT RMB
             O 1BLK . O 1 END
       FDB
                                           OSTRT, QEND.
OZBLK RMB
             100
                     Storage block for Q2.
                     Last location in Q2 storage block.
*OZEND DOU
             #-1
O2DT
                     02 descriptor table: QHEAD, QTAIL.
       RMA
             OZBLK . OZEND
       FDB
                                           OSTRT. OEND.
* Subroutines are provided to initialize a queue (QINIT),
 enqueue a byte (QENQ), and dequeue a byte (QDEQ).
  Each subroutine must be passed the address of the
  descriptor table for the queue to be manipulated.
 SUBROUTINE OINIT -- Initialize a queue to be empty.
 INPUTS
     #QDTBL -- The address of the queue descriptor table
               for the queue to be initialized,
               passed in register X.
  CUTPUTS, GLOBAL DATA, LOCAL DATA -- Hone
  FUNCTIONS
     (1) Initialize the queue to empty by setting QHEAD
         and OTAIL in ODTBL equal to the first address
         in the queue buffer.
 REGISTERS AFFECTED -- CC
  TYPICAL CALLING SEQUENCE
       LDX
             €Q1DT
       JSR
             DINIT
OINIT PSHS
                        Save Y so not affected.
             OSTRT.X
       LDY
                        Put buffer starting addr into Y.
       STY
             QHEAD, X
                        Store into OHEAD and OTAIL.
       STY
             QTAIL,X
                        Restore Y.
       PULS
                        Done, return.
 SUBROUTINE QENQ -- Enqueue one byte into a queue.
 INPUTS
     #QDTBL -- The address of the queue descriptor table
               for the queue to be initialized.
               passed in register X.
    QDATA
              The byte to be enqueued, passed in reg A.
  OUTPUTS
    OPULL
           -- 1 if the queue is already full, else 0;
               passed in condition bit Z.
  QLOBAL DATA, LOCAL DATA -- None.
  FUNCTIONS
     (1) If the queue described by QDTBL is full,
         set OFULL to 1.
     (2) If the queue described by QDTBL is not full,
         enqueue QDATA and set QFULL to 0.
  REGISTERS AFFECTED -- CC
  TYPICAL CALLING SEQUENCE
       LDX
             00 IDT
                        Enqueue byte ABYTE.
             ABYTE
       LDA
       JSR
             OEND
             OVEL.
       BEO
                        Branch if queue ia full.
```

```
OFND
       PSHS
                         Save Y so not affected.
             QTAIL,X
       LDY
                         Get queue tail.
       LEAY
              1. Y
                          Bump to next free location.
       CHPY
             OEND.X
                         Wrap-around?
       BLS.
              OEND 1
       YCI
              OSTRT.X
                          Reinitialize on wrap-around.
QEND1
       OUPY
             QHEAD, X
                         Queue already full?
                          Return with 2=1 if full.
       BEQ
              OENO2
       STA
              [OTAIL.X]
                         Else store QDATA at old tail,
       STY
                          Update tail.
              OTAIL,X
       ANDCC #$FB
                          Set 2:=0 since not full.
OEND2 PULS
                          Restore Y.
       RTS
                         Return.
 SUBROUTINE ODED -- Dequeue one byte from a queue.
  INPUTS
               The address of the queue descriptor table
     CODTBL --
                for the queue to be manipulated,
               passed in register X.
  OUTPUTS
     QEMPTY -- 1 if the queue is empty, else 0;
               passed in condition bit Z.
     QDATA -- The byte dequeued, passed in register A.
  GLOBAL DATA, LOCAL DATA -- None.
  PUNCTIONS
     (1) If the queue described by QDTBL is empty,
     set QEMPTY to 1.
(2) If the queue described by QDTBL is not empty,
         daqueue QDATA and set QEMPTY to 0.
  REGISTERS AFFECTED -- A. CC
  TYPICAL CALLING SEQUENCE
       I.TX
              AO IDT
                         Dequeue a byte into ABYTE.
       JSR
             ODEO
       BEO
              UNDEL.
                         Branch if queue is empty.
       STA
              ABYTE
       PSHS
ODEO
                         Save Y so not affected.
       LDY
             OHEAD, X
                         Get queue head.
             QTAIL,X
                         Queue mpty?
       CMPY
       മ്മ
             ODEO2
                         Return with Z=1 if empty.
              , Y+
                          Read ODATA byte from queue and
       ACI
                           bump Y to next item in queue.
       CMPY
             OEND.X
                         Wrap-around?
       BLS
             ODEO 1
       YQI
             OSTRT, X
                          Reinitialize on wrap-around.
ODEO 1
       STY
             QHEAD, X
                         Save new value of head.
                          Set 2:=0 aince not empty.
       ANDCC #SFB
ODEO2
       PULS
                          Restore Y.
             Y
       RTS
                          Return.
```

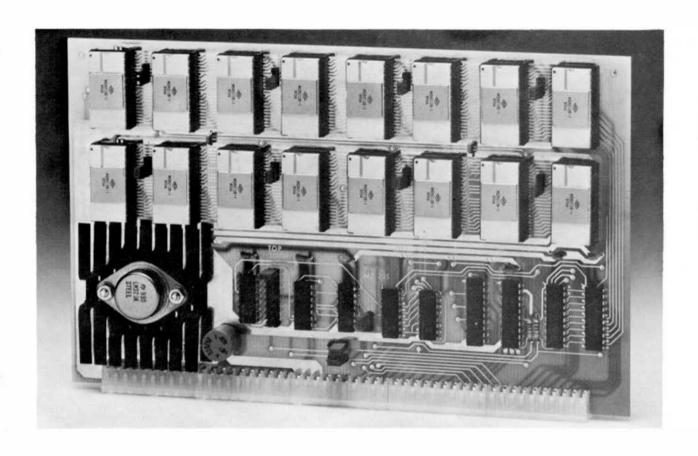
REFERENCES

A fascinating history of subroutines and related concepts can be found in Knuth's Fundamental Algorithms [Addison-Wesley, 1973 (second edition), pp. 225-227], Instructions for calling subroutines were included in all of the early digital computers, although it was not until the 1960s that a pushdown stack was used to store return addresses (in the B 5000 [Lonergan and King, "Design of the B 5000 system," Datamation, Vol. 5, No. 7, May 1961, pp. 28-32; also in Bell and Newell's Computer Structures, McGraw-Hill, 1971]).

The architecture of the B 5000 supported parameter passing on a stack; Algol and other related high-level languages have popularized the use of the stack. More recently, special instructions have been provided in new computer architectures to facilitate parameter passing on a stack (RET n in the 8086 and LINK and UNLK in the 68000).

The correspondence between parameter-passing conventions and run-time storage allocation and operations in high-level languages is explained in *Compiler Construction for Digital Computers* by David Gries [Wiley, 1971].

In the third and final part of this series, we'll introduce the advanced concepts of recursion and coroutines, giving examples in both Pascal and assembly language.



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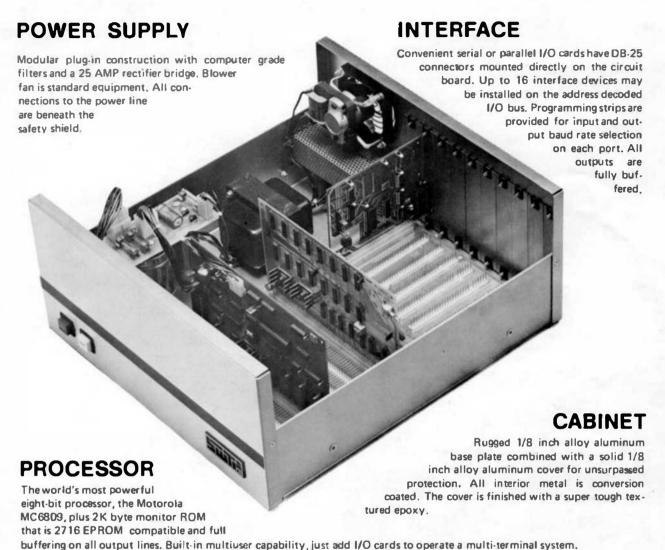
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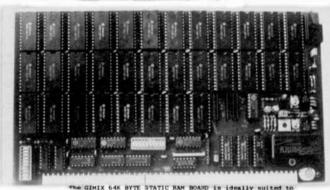
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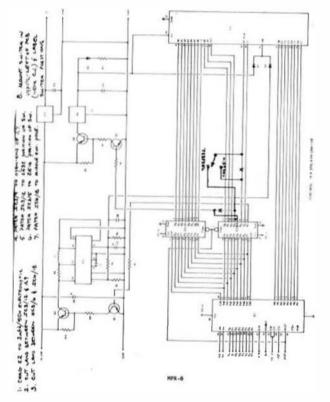
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WESTCHESTER Applied Business Systems P.O. SOX 187 BRIGHTLIFF MANOR: N.T. 10510

DATA MANAOEMENT STETEM PRODUCT ANNOUNCEMENT

The Westchaster Applied Business Systems Data Management System is a complete package which allows the user to define, upriate and perform a variety of data manipulations using hisrarchical or sequential data structures. The system enables the user to custom design record and print formats, add, chiage and delete datebase data and select, sort, cross-reference and print or display file data on the terminal tis a 4n extremely powerful system derived from a number of commercial vendor offerings, capable of stand-alone usage for a wide variety of home and business applications.

Typical stamples of use are schedules, customer data, chickbooks, addresses, inventory, records retention, market trends; mailing lists and most other application requiring the structuring of data. The DMS system, when properly applied, cen displace the need for many apscialized pragrems and, thus, reduce long term software costs.

Two DMS systems are available. DMS1 is an entry level system which supports file sizes up to 32K and DMS2/VM is a full scale business ariented system which permits file sizes up to 1000K. The basic functions of both systems are identical. Both DMS1 and DMS2/VM systems consist of the following progrems:

The DEFIRE program is the facility by which the user identifies the format and content of a database. Field name, format and size and groupe of fields are identified to the system, and the file definition becomes a permanent part of the database. This encels later reference and titling of the data by name. The afructure may be hierarchical, which reduces redundancy, and up to 25 field or group definitions are permitted. Alphanumeric, numeric, decimel, integer, coded and hexidecimal field types are supported. Since the definition is part of the file, and not part of an external data dictionary, the file may be manipulated by standard utility commands such as CDPY, DELETE and RENAME.

The UPDATE program is a facility enabling the user to review, input, add, change and delete database information. These editing functions are executed via the system terminal on an interactive bases. Single character commands facilitate esecution of desired update functions with minimal effort.

The GENER program is the real power of the DMS system. This program accepts English-like instructions from the terminal and produces reports, displays on the terminal screen or generates new databases per user command. The GENER program may be applied to selection, toquiry, analysis and report applications eliminating the need for specific programs. The commands may be stored in a file, reducing the execution of complex functions to the entry of two words!

GEMER functions available include match and range selection of input records on multiple fields, extraction of specified fields, lookup of data on other databases via multiple keys (without predefining record indexes), array generation and summation, sort by multiple fields and formatting of output on the terminal, printer or disk. GEMER command files may set up using symbolic parameters, for which the user is prompted at execution time, enabling inquiry applications. GEMER disk outputs may be reread as input so that batch-like operations may be run for complex processing requirements.

The FORMAT program enables the user to custom design output print forms using database information. The program employs a user supplied control file containing titles, text, graphics and/or field names which, in print form, resembles the desired output. This file is used as a "mask" to format the database fields specified. Field and mask data may appear anywhere on the Print of Pape, and the mask may be of any size enabling use of the FORMAT program for making labels, contracts, bills, letters, preprinted forms and other applications.

Included with the DMS system is an OUTPUT program. This program enables the user to direct output from other programs to the printer, terminal acreen or to dish. The program also supports the variable format capabilities of the Centrolics 737 dot matrix printer.

At the heart of the DMS system is the resident DMS "nucleus" module. This program contains over 200 arithmetic, data manipulation, disk, printer and terminal I/O functions; many of which emulate instructions found in commercial maxi-computers. These functions afford maximum flexibility and standardization, and substantially reduce the size of programs running under DMS. This results in an increase of memory space available for user data and virtually bug-free programs.

DM52/VM employs virtual memory techniques to increase the effective memory available for user data. This methodology utilizes an entire disk drive as a direct access "paging device" to swap in and out sections of memory as they are reducted. The result of this is the ability to direct access files in excess of I magabyte. The Feature is invoked only as needed so that normal operations using email files may utilize both disk drives. A VMDEN program is included with the DM52/VM system and is used to format the paging disk.

The DMS systems are fully compatible with our eccounting system and other database oriented software, allowing specialtied accounting and inventory reports and data manipulation per user requirements.

The DNS1 system sells for e250.00 and the DMS2/VH system for \$650.00. Both systems regulre a license agreement and forms are available from HESTCHESTER applied Susiness Systems. The 32 page user guide is also available for \$19.00, and is deductible from system purchase.

> J. A QLIDEWELL QIMIX 8800/8809 Com 3623 Charless Drive Oppton, Dhy. 45633 G134 425-3667

Mr. Don Williams '68' Micro Journal 3018 Hamill Rd. PO Box 849 Hixon. Tenn 37343

ANKOUNCEMENT

November 26. 1980

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J. J. Glidewell. 3623 Charlene Dr., Dayton, OM 45432

Am Deilmet John Glidewell

When arriving in Chicago after a 28 hour flight from Australia, the last thing [wanted to do was go to a party being held at the Don's residence.

This party was loaded with all well-d and won-derful propels which browth me closer to the 8800 Bus scene, this party was in second to the second to the party was to second to the second to the party was to second to the second to t

I really liked using BABIC OF end noticed his Pascal also running.

Once Allen from tallgrass fethnologiss had UCBS Feecal, whendering around the McCordich wall Reals Managering around the McCordich wall Reals Managering around the McCordich wall Reals Managering also had the McCordich wall Reals are talker ingresses (Commangers also had their new Just processor eiter which had a 880° and a 50° and a 50° and a base and their man Just processor eiter which had a 680° and a 50° as well as the McCordich was seen a

Package.

Don and Joyce Hilliams made their presence known for most of the show.

Charlis Milliams , another employ of the tasily, was left at the
hotel to deal with important dujainess eatters concerning AB Ricro
Journal.

Journa

Jacky Cockinos Paria Radio and Electronics P.D. Bor 380: DarlingNurst 2010 Sydney, MSM. Australia



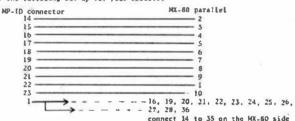
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April 28, 1981

Editor, '68 Micro Journal 2018 Huml 1 Rd. P.O. Box 849 Hixson, Tennessee 37343

I have interfaced an EPSON MX-80 printer to a SWTP SO9 system using the MP-ID parallel port. Since this is a popular printer, I offer the following set up for your readers.



On the Mx-80 side, data lines are 2 thru 9. Line 1 is the strobe input which is effectively generated by line 22 of the MP-10. Line 14 on the MX-80 must be tied high by line 35 on the MX-80 or double spacing occurs. The other lines listed are tied to signal ground. All other lines can be Ignored.

in the MX-80 are two sets of switches. They should be set as follows.

	SI	12	SW1			
Switch #	ON	OFF	ON	OFF		
8			X			
7				X		
6			X			
5			X			
4		X	X			
3		X		X		
2	X		X			
1	X		X			

Sincerely yours. Sou A. Kinty Blair A. Rowley, Ph.D., P.E., C.C.E. Professor and Chairman

BAR/sm

Mr. Bon williams 68 Micro Journal 3018 Hamilt Rd Hisson, Tennessee 37365 15 Ray 1981

I had never associed such a wide evidence for my performance grundles? But from the comments and article on the April and May issues I before some Deople Oidn't Det rivis Drivint. Except low mode to Bar Tellor sinh his TSCTI measurements, which a dome on the same program, same michine agged and size at the ones i had done in my Aprich afficial.

I wont to oddress some of the criticisms volcoo, in Particular Bave Shira's article. I never intended to criticism ISC or their Software, but to compare the few attendance tives FEEL wors have lodge as are as programming inmpules are concerned. I also never Prefereded to Brazeni any last sethod to compute priso numbers (it could have been only program resity) or see how feat a specific problem car be cade to ann one 800°, My interest was to compare Igga toftware octames running ipp_see storithm (in a sty, othe sort her first could have been only professor and therefore show a responsible pritter of a heavily used artered and out on the relief to the relief to state to the seed to the country and therefore show a responsible pritter of a heavily used artered and out only many interest or the relief to othe relief to such a seed to be considered.

By estimations are simples a_blooms with, fig. 2. 365 and 1_mgg. At this side of the ocean there is not much choice if you need a high level tempurem under fig. 2, on either choose one of the TSC Basics or butchate PAIGAL, at though rome our fig. 2, one either all with concern integer and real arithmet It languages may seem strange, it is a very wild comparison from the practical point of vicel many or will be requed eith the TSC Basic et, butchate reach the comparison of the the practical point of vicel many or will be requed eith the TSC Basic et, butchate reach that is not under to use a high level language under FLE, at the process of the comparison, please supply a Basic this herders intogen extinents one 346 HIEL system and is taster than toucher Paced on the under problem.

To compare fill and Withfulls soliquer as Dave Shirt did (April, issue, page 13) is unfair, WHISELS, does not run on a 364 satchine, 3: is not an Borism unless you have 1206 and are organed to pay luice the article of a 564 satchine, ret to mismon pointed out (Mar issue, page 18) that BESIGEP gives a performance rempetable to the UMILLES Beats and ret does not need days than 564 to run. The point here is that we mainter users are Depair left behind for bigger acclinate and more expensive Typiems and I don't think it Is fair. Another paint is that I would deportate if New 545/th and skieled the Clark speed of this system; if his consumment are not made in a 1 fets system then one should wulltiply the taking by the torresponding factor, finally, atthough I admit that ince features title position indegreement are calculated and a size of the system independence and reservancy my useful, atthough I admit that ince features title position indegreement describings but I reality get bothered when My 5419 6/09 takes & or 5 hours to chap across some big progres.

A final word: Lake a look at say relber's tielings 1949 issue, page 27) for fonts. With a 56x FLEE 198g airgle user eaching [the same as my mathing) and using essetty life same algoriths as a did. his folls program runs hears thater jher WFJELE Pasta and just about as talt as the improved algorithm runs. Take into account that 100 his a mingregisted immunous with Fescal is a Sombled Computer, and you see that combited code that encessarily faster than interpreted code. Keep it up, any - I think you searced a paint here.

At Moreira
22 the Paddock
Chaltons at Perer
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Don Milliams '60' Micro Journal 3018 Mamil Road P.O. Dox 649 Hixson Fennessee 37343

Dear Don:

Some of your reasons with famil Corporation Districts who have emitched from famil BASIC to Technical Swatems Consultants BASIC undoubteblum miss the direct cursor rositioning of famil BASIC. The following TSC BASIC subreview will exist the string AS at column E. tow R. where column 0; row 0 is the unper felt hand corner of the CRIT.

9000 PRINT CHR\$(28); 9010 IF PEER(65072):/128 [HEN 9010 9020 PORE 65075:R 9030 PORE 65075:R 9040 PRINT (H\$\$(28)) 9050 PRINT (A\$) 9060 RETURN

I howe that this subrouting solves a problem for some of uour readers.

James L. Dean

Mr. Oco Milliams, Sr. - Publisher *66' Micro Journal P. O. No. 3015 Heatit Road Hisson, Ternessee 37563

(ONE) PARTYLAND CO

Dear Don :

Thanks for your letter of 3/30/81. I ms looking forward to the May lasse and the chance to see some of the contest software. I'll but there ere some real goodles there.

Don. I have SWTPC version 2.6 of five 09 and it has the PSP.CMD in it. I have noted a discrepescy in the isstructions. One pleas it indicated to put the NP-T card is 170 port 5 and in snother it said 170 port s. Meediasa to any I have tried both, but to no svall. Seems that first thing that happers when 1 try to appoin is 1 get a seesage that there is insufficient memory for the printer driver. If luse the DM.CMD simply to see what is evaliable, it indicates 512 bytes (enough). When I then try PSP.CMD, it will load the .CUT files into the queue. but also no printing noours. As suggested by the ereats sheet with the SP-09 CPU, I configured SBOX for no timer. I also tried it with isseryes. I am buffalood. I questigned the MP-T card, but it seems to work fire.

I have sold sy two MPA2 cards so there is no need for you to run the classified. Themis anyway. I think by nest Project will be to upgreds to the GNHI 6609 (FU). By own run one of those? If a, hew do you like it?

Seems there is a GEXIX) users group hore in the BSF Ares. I just found them and the next meeting is 14 April. I plan to strend and maybe I can find a solution to my spooling problem.

I know You are budy, 40 won't take any more of Your time. Com't tell you how much I objoy the Journal. Take care and I'll contribute some more moftware aroun.

Stnoerely yours.

HELP

DOES ANYONE HAVE THE CAPABILITY OF TRANSFERRING TAPE DATA TO SWTPC'S DMF-2 DISKETTES? TAPES ARE 9 TRACKS,1600 BPI,UNLABELED WITH BLOCKING FACTORS OF 1 X 186 AND 1 X 286. CALL ME COLLECT AT 214-276-6196 IF YOU CAN TRANSFER THE DATA OR KNOW ANYONE WHO CAN. LARRY WOLFE, 519 STATE ST, CARLAND, TX 75040

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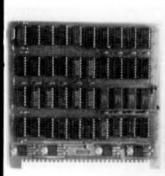
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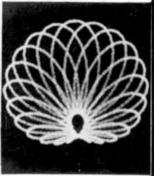
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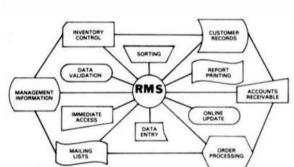
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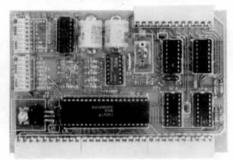
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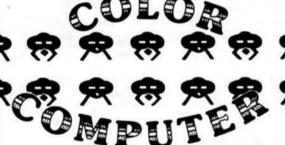
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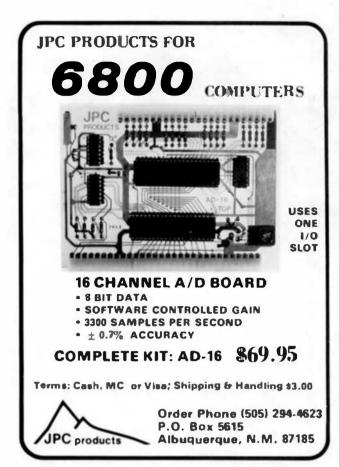
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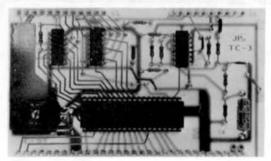


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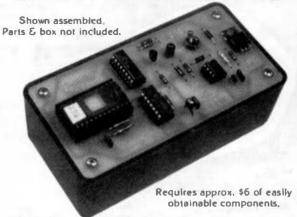
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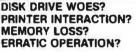
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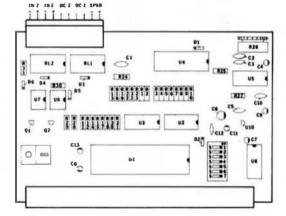
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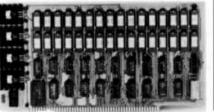
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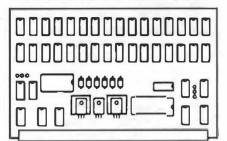
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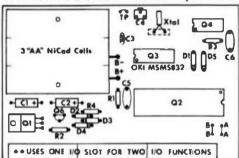
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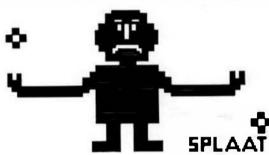
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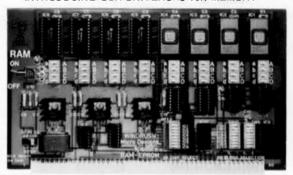
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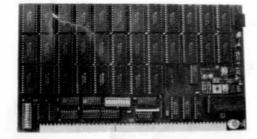
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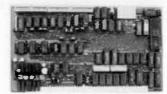
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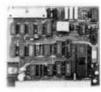
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